A CASE FOR HIGH CAPACITY COAL TRUCKS TO REDUCE COSTS AND EMISSIONS AT ESKOM

C C DE SAXE[1,2*], J van EEDEN[3], A STEENKAMP[1], O MOKONE[2]

[1]CSIR Smart Mobility, 627 Meiring Naudé Road, Pretoria, 0081
[2]School of Mechanical, Industrial & Aeronautical Engineering, University of the Witwatersrand, 1 Jan Smuts Ave., Johannesburg 2000
[3]University of Stellenbosch, Industrial Engineering, Pr. Bag X1, Matieland, Stellenbosch
*Corresponding author: Tel: 012 841 4013; Email: cdsaxe@csir.co.za

ABSTRACT

South Africa's national power utility, Eskom, is under heavy strain to maintain an undisrupted electricity supply and contain costs, while at the same time reducing its environmental impact. In 2018/19, Eskom acquired 118 Mt of coal, at a purchase cost of approximately R 47 billion, of which around R7 billion (15%) can be attributed to the transport of coal via conveyor, rail and road. Eskom has been unable to meet its road-to-rail modal shift targets, and so road haulage still accounts for around 30% of coal deliveries. The "Smart Truck" or "PBS" demonstration project in South Africa has shown how an innovative approach to truck design and regulation can drastically improve the efficiency of road haulage, reducing the cost per tonne-km, while reducing emissions and improving safety. An existing Smart Truck trial in coal transport has demonstrated a 15% reduction in fuel use and associated carbon emissions per tonne-km, which translates into an approximate 6% reduction in total road transport costs. This was achieved through the introduction of innovative 74-tonne tridem interlink truck combinations, which has resulted in fewer truck trips and reduced costs for the same haulage task. At the same time, the trucks are more road friendly due to additional axles and fewer truck trips, and the trucks are designed to be inherently safer than the conventional coal interlinks currently in use. In this paper, we benchmark the costs and emissions of Eskom's current road haulage coal supply operations in South Africa, and calculate the potential savings from migrating to 74-tonne interlink PBS truck combinations. We demonstrate potential savings of R 120 million and 35 000 tonnes of CO2 per year, while removing 300 000 truck trips from the roads.

Key words: road freight transport, coal, Eskom, high capacity vehicles, performance-based standards, transport emissions, transport costs

1 INTRODUCTION

South Africa's national power utility, Eskom, is no doubt facing some challenges. This is no more evident than in the country's ongoing load-shedding programme. Load-shedding reached an unprecedented Stage 6 in December 2019, meaning that the utility was required to shed 6000 MW of load to protect the grid from collapse. All the while, the utility is under heavy strain to contain costs, while at the same time reducing its environmental impact.

In the Eskom Factor 2.0 report (Eskom Holdings SOC Ltd, 2019), the utility reviewed its performance and impact in South Africa against a number of economic, social and environmental indicators, for the period 2012-2018. The first three indicator "pillars" and their sub-pillars are shown in Figure 1, in which the utility's externally assessed performance in each is indicated through the green-orange-red colour coding. It is clear that there are significant remaining challenges around costs (red for impact on public finances, orange for pricing and competitiveness) and environmental impact (red for greenhouse gas emissions and air quality).

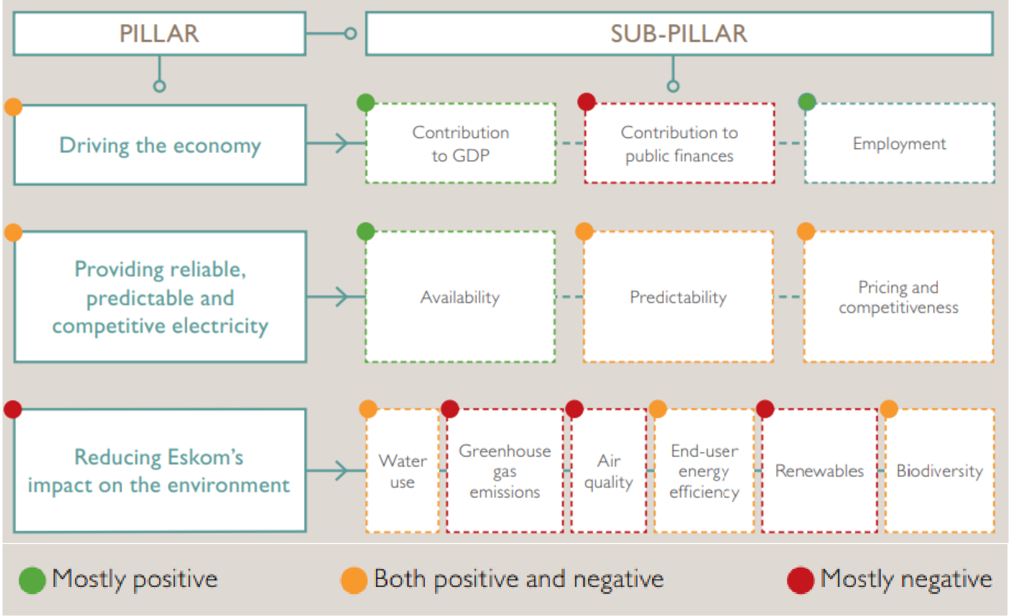
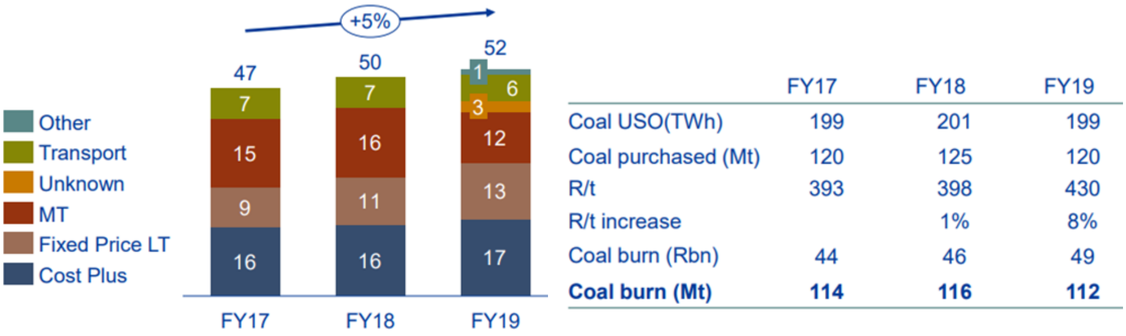


Figure 1: Eskom Factor 2.0 outcomes, the first three pillars (Eskom Holdings SOC Ltd, 2019)

1.1 Coal use at Eskom

At the heart of Eskom's business and impact is coal, with over 90% of its generating capacity relying on the resource (Eskom Holdings SOC Ltd, no date). This coal must be purchased, transported to site, and finally burnt for the production of electricity. In 2018/19, Eskom reported that 118 Mt of coal was acquired, and hence transported (Eskom Holdings SOC Ltd, 2019). It is foreseeable that in the future there may be a shift away from coal towards renewable resources, but big changes are not expected in the short term.

Details on the specific costs associated with the purchase and transport of the coal are not clear in the integrated report. However, for this one can refer to the slightly older NERSA public hearing report of November 2017. Figure 2 shows a breakdown of the costs of coal for the 2017 financial year, as well as forecasts for 2018 and 2019 (Eskom Holdings SOC Ltd, 2017). In 2017, 120 million tonnes of coal was purchased and transported, at a total cost of R 47 billion and an average price of R393 per tonne. Transport costs accounted for R 7 billion or about 15% of the total coal cost for the year.



	FY17	FY18	FY19
Coal USO(TWh)	199	201	199
Coal purchased (Mt)	120	125	120
R/t	393	398	430
R/t increase		1%	8%
Coal burn (Rbn)	44	46	49
Coal burn (Mt)	**114**	**116**	**112**

Figure 2: Eskom cost breakdown 2017-19 (Eskom Holdings SOC Ltd, 2017)

In terms of environmental impact, Eskom reported that 114 million tonnes of coal was burned in 2018/19, resulted in the release of 221 million tonnes of CO_2 emissions into the atmosphere (Eskom Holdings SOC Ltd, 2019), or about 42% of South Africa's total carbon emissions (Carbon Brief, 2018).

1.2 Coal transport in South Africa

As mentioned, approximately R7 billion (or 15%) of Eskom's coal purchase costs can be attributed to transport. Due to the low value, high volume nature of coal, coal-fired stations are mostly strategically located near major coal fields and coal mines, so as to minimise the coal transportation task in terms of cost and time. An illustration of the North-East South African coal region is shown in Figure 3.

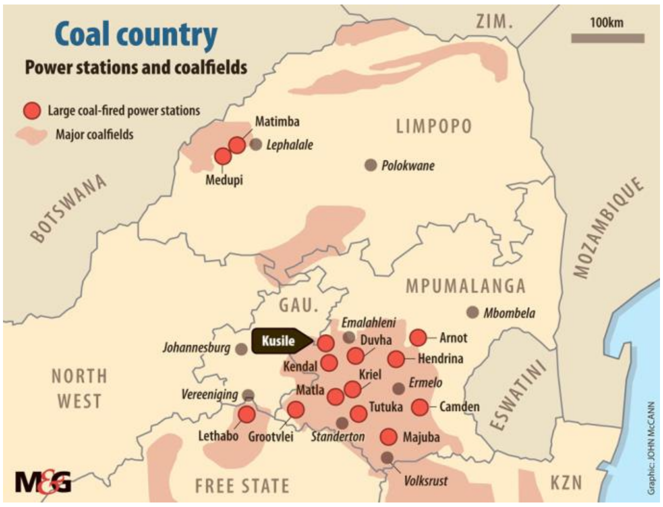


Figure 3: Coal-fired power stations and coal sources in South Africa (Davie, 2019)

Eskom makes use of three transport modes to get coal from source to power station, namely conveyor, rail and road. According to Eskom's head of road logistics in 2015, Nico Singh, the modal split by tonnes is approximately 60% conveyer, 30% road, and 10% rail (Solomons, 2015). Conveyer transport is by far the cheapest per tonne-km (at around 20% the cost of road transport (Saxby and Elkink, 2010)), rail the next economical, and road haulage the most expensive at approximately R1.18/tonne-km for a fully laden 56-tonne interlink at 50% utilisation (Braun, 2018).

Conveyer systems are therefore the most preferred given their significantly cheaper cost, and are used wherever possible. However, such systems are typically only feasible for the shorter lead distances, applied to mostly less than 5 km, but could be longer, such as the 7 km from the Grootegeluk mine to the Medupi power station (Exarro, no date). The feasibility and business case for either conveyor, road or rail infrastructure investment would be determined by volume, contract duration, and distance amongst other factors.

The remaining longer distance volumes must be hauled by either rail or road. Rail is the cheaper option, but infrastructure constraints, service provision challenges, and flexibility mean that not all non-conveyer coal can be moved by rail. The utility is trying to address some of these constraints to move more coal from road to rail, and has an annual target of increased rail usage. However the targets are not being met (Eskom Holdings SOC Ltd, 2019). In 2015 Nico Singh reported that Eskom transports coal over about 3200 km of Mpumalanga road network comprising 30-40 haulage routes, using a fleet of over 2 000 trucks, travelling an average of 600 000 km/day (Solomons, 2015).

1.3 Transport-related carbon reporting

Globally, transport is a major contributor of carbon emissions, and in South Africa transport accounts for around 10% of the country's greenhouse gas emissions (DEA, 2019). Road transport accounts for approximately 90% of this figure, and of this heavy trucks such as those used to transport coal comprise 21% (DEA, 2014).

Eskom's carbon emissions figure of 221 Mt only relates to the direct emissions as a result of combustion of coal. Modern carbon reporting practice is careful to acknowledge the indirect or secondary emissions associated with a particular business or operation. The GLEC framework (Greene and Lewis, 2019), created by the Global Logistics Emissions Council under the Smart Freight Centre, outlines three "scopes" of emissions as follows:

Scope 1 GHG emissions: "Direct emissions from sources that are owned or controlled by the reporting organization."

Scope 2 GHG emissions: "Indirect emissions that are associated with energy that is transferred to and consumed by the entity."

Scope 3 emissions: "Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. transmission and distribution losses) not covered in Scope 2, outsourced activities, waste disposal."

The emissions associated with the transport of coal for Eskom fall under the Scope 3 category, as "transport-related activities in vehicles not owned or controlled by the reporting entity". Furthermore, for a given transport operation, there too are direct and indirect sources of carbon emissions. Direct emissions (known as "tank-to-wheel" emissions) are the emissions which are produced through the on-board combustion of fuel by a vehicle. However, to get the fuel to the truck's fuel tank requires other carbon-emitting processes in the full fuel life-cycle, such as oil extraction, refining and distribution ("well-to-tank" emissions). The two together give an indication of the total emissions resulting from a transport activity, known as "well-to-wheel" emissions. Emissions factors per litre of fuel burned, or per tonne-km, can be found in the literature for a variety of fuels. A summary of relevant emission factors is given in Table 1.

Table 1: Emissions factors for truck transport (data from (Greene and Lewis, 2019)**)**

	Tank-to-Wheel (TTW)	**Well-to-Wheel (WTW)**
Emission intensity factors per tonne-km		
Artic truck up to 60t GVM (Heavy load, diesel fuel)	44[1] (54[2]) g CO_2e/t-km	55[1] (67[2]) g CO_2e/t-km
Artic truck up to 72t GVM (Heavy load, diesel fuel)	38[1] (46[2]) g CO_2e/t-km	48[1] (59[2]) g CO_2e/t-km
Fuel emission factor per litre fuel burned		
Diesel	2.43[3] kg CO_2e/l	2.98[3] kg CO_2e/l

[1] Factors for Europe and South America
[2] Factors scaled by a 22% uplift factor for the African region
[3] Factors based on North American data, as recommended in the GLEC framework

1.4 High capacity vehicles and the South African "Smart Truck" pilot project

"High capacity vehicles" (HCVs) are trucks or truck combinations which are designed to carry more freight than conventional vehicles, through concessions on legislated weight and/or dimension regulations. The result is a more efficient transport system in which the same freight volumes can be moved using fewer trucks and trips. The use of HCVs has been successfully trialled or implemented in several countries around the world including in

Australia, New Zealand, Canada, and parts of Europe (Billing and Madill, 2010; de Pont and Taramoeroa, 2010; Kraaijenhagen *et al.*, 2014; National Transport Commission, 2017). Such programmes typically require a number of assurances regarding the safe design of the trucks, approved routes, safe and professional management of the transport operation, road wear impact reduction, and vehicle monitoring.

In South Africa, the National Department of Transport has supported a special trial of HCVs since 2007. The pilot project is known as the “Smart Truck” or “Performance-Based Standards” (PBS) pilot project, and has demonstrated drastic improvements to the efficiency of the operations participating in the trial, with reduced costs per tonne-km, while reducing emissions and improving safety (P. A. Nordengen *et al.*, 2018). The vehicles operate on fixed pre-approved routes assessed to be suitable and safe for the type of truck, and must undergo detailed assessments of low-speed and high-speed truck safety, road wear impact, and bridge loading impact against a set of strict standards before approval.

Monitoring data have been collected by the CSIR from approximately 300 trucks in the South African trial, along with data on conventional trucks preforming the same freight tasks. The data demonstrate a 12% reduction in fuel use and related carbon emissions per tonne-km, a 22% reduction in truck trips, a 39% reduction in crash rates, and an average reduction in road wear impact of 13% for PBS operations versus the conventional baseline operations (P. Nordengen *et al.*, 2018). Commodities represented in the trial include timber, mining ore, fuel, sugar, coal, beverages, containers, and paper reels.

2 OBJECTIVES & METHODOLOGY

The objective of this study is to assess the cost and emissions reduction potential of high capacity coal trucks for the transport of coal to Eskom power stations. Data collected from the existing PBS coal operations offer an insight into the larger savings potential of mass adoption, and these can be tied to existing operational data to give an estimate of the actual savings in Rands and kg CO_2.

The methodology used is as follows:

1. Analyse monitoring data for the existing PBS coal truck fleet and baseline vehicles, and calculate the fuel savings and typical lead distances.
2. Benchmark Eskom’s existing road coal transport operations to ascertain the total freight task (in tonne-kms), and calculate the associated costs and emissions.
3. Estimate the cost and emissions saving potential of migrating the full fleet of coal transport operations for Eskom to PBS coal truck combinations.

3 ANALYSIS AND RESULTS

3.1 Performance of the PBS coal trucks

Within the PBS trial, there are currently 60 PBS truck combinations transporting coal to power stations. The first PBS coal trucks started operating in 2017, and the numbers have since grown. Figure 4 shows a comparison of the PBS and “baseline” truck combinations. The baseline trucks are conventional truck combinations performing the same freight task on the same routes. The baseline vehicle is a 56-tonne gross mass interlink combination (also known as a B-double), with tandem axle groups on the trailers, and is 22 m in length. The current gross mass and maximum length limits in South Africa are 56 tonnes and 22 m (DoT, 2003). The PBS combination is a 22-meter 74-tonne gross mass interlink, with tridem axles on the trailers to support the additional load without exceeding axle load limits (and hence minimising impact on the road pavement).

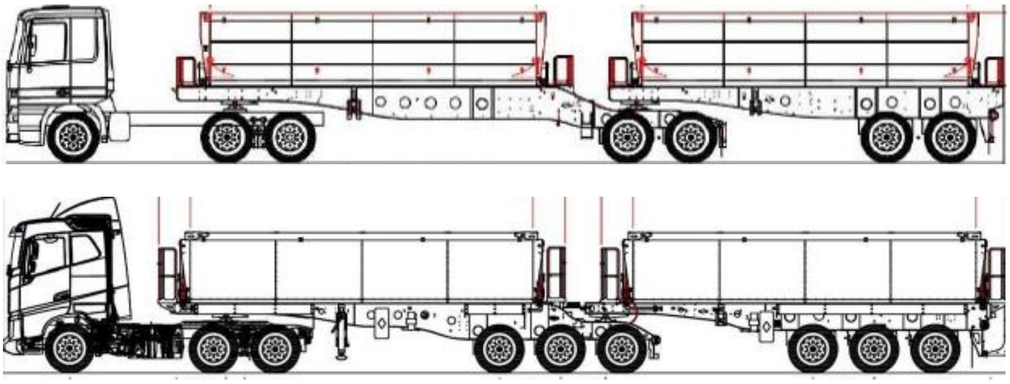


Figure 4: Conventional 56-tonne tandem interlink side-tipper (top) and 74-tonne tridem interlink side-tipper (below) (both 22 m in length)

The PBS combinations operate under special permit as part of the PBS pilot project allowing them additional payload. Both PBS and baseline vehicles adhere to the maximum axle load limits prescribed in the National Road Traffic Act. Table 2 summarises the truck loading information. For both PBS and baseline operations, as is typical for bulk heavy transport, the trucks operate fully laden in one direction and unladen on the return trip.

Table 2: Comparison of mass data between PBS and conventional interlink

	PBS	Baseline
Gross mass (tonnes)	74	56
Average payload (tonnes)	50	35

Monitoring data have been collected by the CSIR for the PBS trucks as well as the baseline vehicles. A summary of consolidated monitoring data for the PBS trucks versus the baseline conventional trucks for these coal operations is given in Table 3 and Table 4. These data were self-reported monthly by the operators, and consolidated by the CSIR.

Table 3: Summarised monitoring data: baseline coal trucks

	tonnes	kms	trips	fuel (litres)
2017	24 475	154 746	690	86 143
2018	27 219	192 047	778	104 401
2019	23 046	148 565	664	82 205
TOTAL	74 740	495 358	2 132	272 749

Table 4: Summarised monitoring data: PBS coal trucks

	Tonnes	kms	trips	fuel (litres)
2017	703 266	1 033 731	14 866	714 434
2018	1 214 280	3 123 450	26 651	1 961 933
2019	797 799	6 200 432	17 594	3 655 540
TOTAL	2 715 346	10 357 613	59 111	6 331 907

From the above data, together with data on fuel use (total litres per year), one is able to calculate information needed to estimate overall cost and emissions saving for the operation. The total tonne-kms, fuel consumption, fuel savings, and lead distance can be calculated as follows:

$$\text{tonne-km} = \frac{\text{tonnes} \times \text{kms}}{\text{trips}} \tag{1}$$

$$\text{fuel consumption (litres/tonne-km)} = \frac{\text{litres fuel}}{\text{tonne-km}} \tag{2}$$

$$\text{fuel saving (\% litres/tonne-km)} = \frac{\text{Fuel consumption baseline} - \text{Fuel consumption PBS}}{\text{Fuel consumption baseline}} \tag{3}$$

$$\text{lead distance} = \frac{\text{kms}/2}{\text{trips}} \tag{4}$$

Calculated results for tonne-kms and average lead distances are summarised in Table 5. Total fuel savings and a total average lead distance were calculated based on all data (2017-19), and are summarised in Table 6. Note that the calculated 15% saving per-tonne-km agrees very well with the savings suggested in Table 1, where the emission intensity factor reduces from 54 g CO2e/tonne-km for a GVM of 60 tonnes to 46 g CO2e/tonne-km for a GVM of 72 tonnes (a 14.8% reduction).

Table 5: Calculated tonne-kms and lead distances, baseline and PBS trucks

	Baseline			PBS		
	tonne-km	**fuel cons. (l/tonne-km)**	**ave. lead distance**	**tonne-km**	**fuel cons. (l/tonne-km)**	**ave. lead distance**
2017	5 489 013	0.0157	112	48 902 755	0.0146	35
2018	6 718 991	0.0155	123	142 311 489	0.0138	59
2019	5 156 420	0.0159	112	281 158 494	0.0130	176
TOTAL	17 364 425	0.0157	116	472 372 737	0.0133	88

Table 6: Calculated average fuel saving and lead distance

Fuel saving (% litres per tonne-km)	15%
Average lead distance (all operations)	89 km

3.1.1 Validation of lead distance

The above lead distance was calculated based only on the routes operating PBS vehicles. To get a representative number for comparison, the Freight Demand Model ™ (FDM™) was used, a supply and demand gravity model for transportation freight flows. The model has been refined and had multiple updates over the past decade, rendering a robust, peer-reviewed model which quantifies freight movements per mode, for 83 commodities, between the 356 districts of South Africa, including international movements (refer to (Havenga and Simpson, 2018) for the methodology for compiling the model and 2017 data). The model is updated annually and the updated data for 2018 were obtained from the authors.

Power station coal is one of the 83 commodities analysed and detailed in the FDM™. With the permission of the developers, power station volumes for conveyor, road and rail between specific origins and destinations were analysed. The modelled power station coal volumes and lead distances for each mode for 2018 is shown in Table 7. The resultant average lead distance for road haulage is 97.5 km, which agrees well with the figure of 87 km derived from PBS and baseline vehicle monitoring data. The figure of 97.5 km will be used for further analysis.

Table 7: Lead distance and volume per mode for South African power station coal in 2018

Mode of transport	Lead distance (km)	Volume (million tonnes)
Conveyor	3	75.9
Rail	275	8.7
Road	97.5	33.3
Total	**49.8**	**118**

3.2 Cost and emissions benchmarking

The information gathered thus far regarding Eskom’s coal transport operations is summarised in Table 8.

Table 8: Consolidated operational data on Eskom’s coal transport operations

Parameter	Value
Coal transported (2018/19) (tonnes)	118 000 000
Coal transported by road (30% of total) (tonnes)	35 400 000
Road transport cost per tonne-km	R1.18
Number of haulage routes (average of 30-40)	35
Average lead distance (km)	97.5

From this we can calculate the total tonne-kms of coal haulage by road for Eskom’s coal supply operations as follows:

$$\begin{aligned}\text{total tonne-km} &= \text{total tonnes } \times \text{lead distance}\\ &= 35\,400\,000 \text{ tonnes } \times 97.5 \text{ km}\\ &= \mathbf{3\,451\,500\,000} \text{ tonne-km per year}\end{aligned} \tag{5}$$

The total cost of this operation can then be estimated to be:

$$\begin{aligned}\text{total cost } &= \text{tonne-km} \times \text{R/tonne-km}\\ &= 3\,150\,600\,000 \text{ tonne-km} \times \text{R } 1.18\text{/tonne-km}\\ &= \mathbf{R\ 4\,072\,770\,000}\end{aligned} \tag{6}$$

As a check, this figure is compatible with the quoted total transport cost of R7 billion (Eskom Holdings SOC Ltd, 2017), where road transport accounts for 30% of haulage, but is the most expensive mode R1.18/tonne-km, versus the cheaper rail (10% of haulage) and cheapest conveyer (60% of haulage).

The total tank-to-wheel emissions associated with this operation can be estimated using the GLEC emissions intensity factor (see Table 1) for articulated trucks up to 60 t GVM (heavy load, diesel fuel) as follows:

$$\begin{aligned}\text{total emissions (TTW) } &= \text{tonne-km} \times \text{kg CO2e/tonne-km}\\ &= 3\,451\,500\,000 \text{ tonne-km} \times 54 \text{ g CO2e/tonne-km}\\ &= \mathbf{186\,381} \text{ tonnes CO2}\end{aligned} \tag{7}$$

And similarly for well-to-wheel emissions:

$$\text{total emissions (WTW)} = \mathbf{231\,251}\ \text{ tonnes CO2}$$

Lastly, the total number of truck round trips can be estimated as follows:

$$\begin{aligned}\text{number of trips} &= (\text{total tonnes / payload}) \\ &= (35\,400\,000 \text{ tonnes / } 35 \text{ tonnes}) \\ &= 1\,011\,429 \text{ trips}\end{aligned} \tag{8}$$

The results are summarised in Table 9 below.

Table 9: Calculated cost and emissions benchmark for Eskom's road coal transport

Total cost of road transport of Eskom's coal	R 4 072 770 000
Transport emissions (TTW) (tonnes CO2)	186 381
Transport emissions (WTW) (tonnes CO2)	231 251
Total truck trips per year	1 011 429

3.3 Cost and emissions saving potential

The 60 PBS coal trucks operational in 2019 represent only 3% of the estimated 2000 trucks transporting coal for Eskom (Solomons, 2015). This number is even smaller for 2018 and 2017. It was hence assumed that the published and calculated cost and tonnage data for Eskom reflects an entirely non-PBS fleet of trucks. It was also assumed that the existing fleet consists primarily of 56-tonne tandem interlinks. Calculated savings from a 56-tonne to 74-tonne PBS truck were hence assumed to be representative of migrating the full fleet to 74-tonne PBS trucks. If any of the existing fleet are smaller tractor-semitrailer combinations, the resulting savings will only be higher given a less productive baseline.

With an average savings of fuel per tonne-km of 15% (see Table 6), the potential savings in costs and emissions can be calculated using the total costs and emissions calculated above. From a cost point of view, fuel accounts for 40% of transport costs (Havenga *et al.*, 2016), and so a fuel saving of 15% translates into a total cost saving of 15% × 40% = 6%. The portion of this saving which ultimately gets passed on to the consignee (i.e. Eskom) is ultimately a business decision for the transport operator in terms of increased profits versus competitive pricing advantage. It will be assumed that 50% of this saving will be passed on to Eskom, or 3%.

So, if the full fleet of coal trucks transporting to power stations were to be migrated from 56-tonne interlinks to 74-tonne interlinks, the cost saving to Eskom can be estimated as follows:

$$\begin{aligned}\text{total cost savings} &= \text{total cost} \times \frac{\text{fuel saving}}{\text{tonne-km}} \times \frac{\text{fuel cost}}{\text{transport cost}} \times \frac{\text{saving passed to Eskom}}{\text{total saving}} \\ &= \text{R } 4\,072\,770\,000 \times 15\% \times 40\% \times 50\% \\ &= \mathbf{R\ 122\ 183\ 100} \text{ per year}\end{aligned} \tag{9}$$

From an emissions point of view, the 15% reduction in fuel use per tonne-km translates directly into a 15% reduction in emissions per tonne-km. Hence the savings can be calculated directly:

$$\begin{aligned}\text{total emission savings (TTW)} &= \text{total emissions (TTW)} \times \frac{\text{fuel saving}}{\text{tonne-km}} \\ &= 186\,381 \text{ tonnes CO2} \times 15\% \\ &= \mathbf{27\ 957} \text{ tonnes CO2}\end{aligned} \tag{10}$$

$$\begin{aligned}\text{total emission savings (WTW)} &= \text{total emissions (WTW)} \times \frac{\text{fuel saving}}{\text{tonne-km}} \\ &= 231\,251 \text{ tonnes CO2} \times 15\%\end{aligned} \tag{11}$$

$$= \mathbf{34\ 688}\ \text{tonnes CO2}$$

Lastly, the number of truck trips removed from the road can be calculated using equation 8 as follows, noting the increase in payload from 35 to 50 tonnes:

$$\begin{aligned}\text{number of trips saved } &= (1\ 011\ 429\ \text{trips}) - (35\ 400\ 000\ \ \text{tonnes} \ /\ 50\ \text{tonnes}) \\ &= \mathbf{303\ 429}\ \text{trips}\end{aligned}$$

The savings are summarised in Table 10.

Table 10: Calculated cost and emissions savings potential for Eskom's road coal transport

Cost saving potential (annual)	R 122 183 100
Emissions saving potential (TTW) (annual tonnes CO2)	27 957
Emissions saving potential (WTW) (annual tonnes CO2)	34 688
Truck trips saving potential (annual)	303 429

4 CONCLUSIONS AND FUTURE WORK

In this paper, we have benchmarked the costs and emissions of Eskom's current road haulage coal supply operations in South Africa, and calculated the savings which could result from migrating all road coal operations to 74-tonne interlink PBS truck combinations. Savings of R 120 million and 35 000 tonnes of CO2 per year were demonstrated, while removing 300 000 truck trips from the roads, assuming a 50-50 cost benefit sharing between transport operators and Eskom. These savings are notable, at a time when Eskom is facing heavy cost and environmental impact challenges. Furthermore, the PBS truck combinations have been shown through other work to be a more road friendly alternative per tonne-km, an important consideration given the current maintenance backlog of provincial roads in Mpumalanga.

The migration to high capacity coal trucks is possible within the current PBS pilot project in South Africa, with already 60 PBS trucks transporting coal for Eskom. Participation and uptake by transport operators is voluntary, incentivised by the reduced costs per tonne-km and hence competitive pricing advantage. Fleet-wide adoption can be accelerated through coal transport contract requirements, or through regulation, for the benefit of the country and its taxpayers. A migration to PBS trucks will also require a review of routes for suitability, but this is normally constrained by vehicle length implications (whereas these vehicles are no longer than a standard interlink). Formalisation of the South African PBS programme into legislation would reduce risk to the operators substantially, and help accelerate costs and emission reduction at Eskom and almost every other industry in South Africa.

It should be noted that these recommendations and findings do not deny the value of the road-to-rail initiative. Moving more freight by rail in any industry where it is relevant must be encouraged and supported as much as possible, for the overall benefit to society and industry through lower costs and separation of heavy freight vehicles from passenger traffic. However the migration to rail has faced several challenges over the recent years, and continues to do so. This will also require substantial long term infrastructure investment, including in rail off-loading infrastructure at the power stations. While some freight may shift to rail in future, there will always be a need for a large proportion of freight to move on road. (This is not unique to South Africa). And so, for whatever freight must be moved by road, initiatives such as this help to make that road freight as efficient, safe and road-friendly as possible.

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