

## What to do about Eskom

By Dirk de Vos



**Dirk de Vos** is founder and director of QED solutions, a corporate finance and advisory firm

This year, in his budget speech, the Finance Minister announced that Eskom, the state-owned, crisis-riven electricity utility would be unbundled into three entities through the creation of subsidiary companies under Eskom Holdings. The decision flows out of a report of the Eskom Sustainability Task Team, appointed by the President in early December 2018.

The three entities will be responsible for generation, transmission and distribution, and each will have its own board and management structures. Eskom, it was announced, would also be supported by "an allocation" of R23 billion per year for the next decade, although the effect of this was undermined by Nersa, which adjusted the tariff award to Eskom downwards to take account of what it deemed to be a new source of revenue.

A Chief Reorganisation Officer (CRO), nominated by the Minister of Finance and the Minister of Public Enterprises, is also to be appointed. The CRO will work with Eskom's board and management to implement

the unbundling, ensure that Eskom cuts costs, monitor critical maintenance of the power plants, and oversee Eskom's capital expenditure programme. Eskom is also required to achieve operational annual savings outside its salary bill amounting to around R20 billion per annum.

The powers of the CRO will be clarified in a new shareholder compact with the Minister of Public Enterprises. Other issues such as executive remuneration will be tied to delivering on the terms of that compact. The unbundling might take up to three years, during which a variety of measures will have to be adopted to put Eskom on a more sustainable footing and to ensure long-term energy security.

The reaction of Moody's, the only rating agency that continues to rate South Africa's debt as investment grade, at the time of the announcement was telling: "Until the government provides a clear and detailed plan of how Eskom will be restructured, the troubled power utility will continue to overshadow the



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country's public finances [and] ratings," adding that, "details of the plan to rescue Eskom and, in particular, how the split into three companies will work and how the assets and liabilities will be apportioned between them, was noticeably absent."<sup>1</sup>

Of course, Eskom's unbundling does not solve the multiple, multiplying problems relating to its financial, operational and environmental sustainability. It is, however, an important first step, one that was taken only after Eskom had reached the point that, absent another bailout, it would not be able to meet its financial commitments and would default on its debts. Apart from the obvious operational risks of Eskom's insolvency, a default would trigger a large-scale financial crisis for the country because of government guarantees and because a default on one portion of public debt might trigger accelerated repayment schedules for other debt too. The pressure of Eskom's debt is obvious from one statistic: at nearly R500 billion, Eskom's debt is now 2.5 times greater than its gross revenues, making debt-service costs unpayable out of its operational income.

The purpose of this report is to identify the key challenges Eskom faces and to suggest possible solutions. In the spirit of the unbundling, each subsidiary to be formed is considered separately.

## Generation

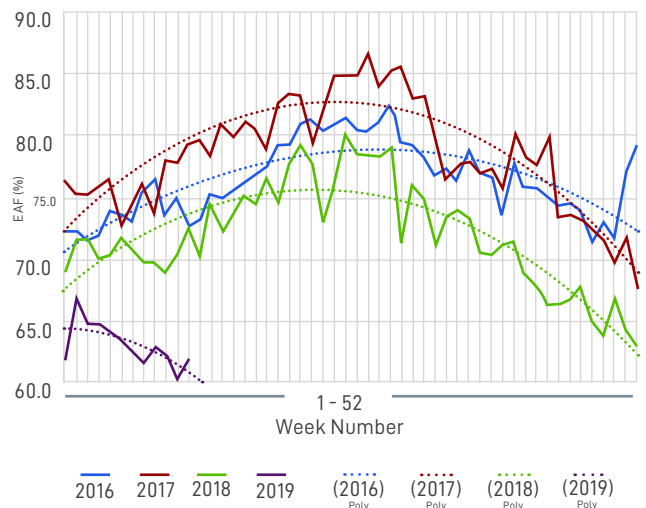
Eskom's multiple problems centre in generation, with three distinguishable issues looming largest.

### Plant maintenance and retirement

Most of Eskom's power stations were built in the late 1970s and the 1980s. Their age has an inevitable consequence: increasing downtime both for planned maintenance and as a result of unplanned faults. This is reflected in the fall of the Energy Availability Factor (EAF) – a measure of the proportion of Eskom's generating capacity that is actually on line at any given time – over the previous three years.

As Figure 1 shows, by early 2019, EAF had declined to

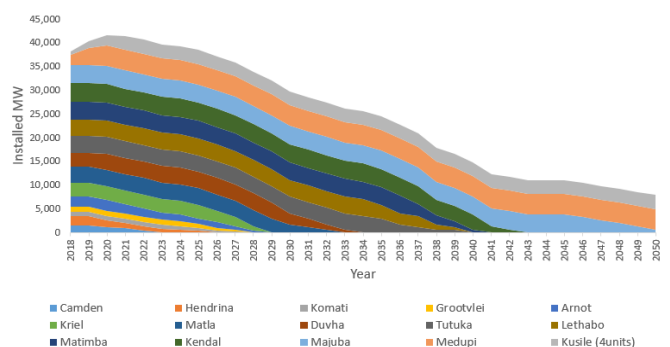
Figure 1: Eskom week-on-week EAF (%) for 2016, to date



Source: Prepared by Chris Yelland, based on Eskom data

just over 60 per cent some of the time, necessitating stage four loadshedding. Like all machinery, as time goes on, generating units become less reliable and need to be retired. Eskom has already begun the process of retiring its older coal fired power stations (Figure 2). This plan may have to be accelerated, however, because many of Eskom's power stations cannot achieve statutory air quality standards.

Figure 2: Eskom coal fleet retirement schedule



Source: Integrated Resource Plan 2018

In 2018, the Department of Environmental Affairs (DEA) announced its intention to set new rules for compliance with the minimum atmospheric emission standards relating to the burning of coal in coal-fired power plants. These new regulations mean that Eskom will no longer be able to postpone compliance with existing minimum air quality

<sup>1</sup> <https://www.businesslive.co.za/bd/national/2019-02-21-moodys-changes-its-mind-on-sa-outlook-due-to-eskom/>

standards beyond 2020 and is permitted only one five-year postponement of the far more demanding new air quality standards.

### Medupi, Kusile and rapid technological change

Eskom's decision in 2007, to build two giant coal-fired power stations is the principal reason for its current crisis. Poor project conception and design, together with dodgy procurement and woeful execution, have dogged both projects from the start. Each is a classic example of Flyvbjerg's Iron Law of Megaprojects: "over time, over budget, under benefits, over and over again."<sup>2</sup>

At Medupi, just four of the six generating units are operational even though all were supposed to be on-line by 2014. The total budget to completion when the final specifications were settled in 2009 was R80 billion, but it is now expected to cost R145 billion excluding interest expenses. And this excludes the costs of the extensive repairs needed by the first four units (which generate only 70 per cent of the power they are supposed to provide).<sup>3</sup> In all, including interest costs during construction, Medupi will have cost over R200 billion.

This performance is mirrored by Kusile which is even more expensive and longer-delayed. While Medupi as a stand-alone entity should produce electricity to the grid at a cost, in today's rands, of R1.31/kWh (a figure that is already more than 50 per cent higher than Eskom's average tariff), at best, Kusile will produce electricity at over R1.50/kWh.

On their own, the debt service costs of Medupi and Kusile would have absorbed all of the R23 billion-a-year bailout provided to Eskom by government had Nersa not discounted the "revenue" when making its tariff award.

Making matters worse, the rapid development of renewable energy technologies means that, on current trajectories, these could be far cheaper than the electricity generated at Medupi and Kusile.

Indeed, these will become the cheapest sources of new energy: if the procurement of renewables were to continue in something like its current form to 2030, utility scale renewables including the first rounds would have an average tariff of R0.78/kWh (Table 1).<sup>4</sup>

Table 1: Renewable energy tariffs to 2030

	Tariff R/kWh	kWp Allocation	Cumulative Tariff R/kWh
<b>Round 1</b>			
Solar PV <b>625MWp</b>	2.67	625	2.67
Onshore Wind <b>649MWp</b>	1.14	649	1.14
<b>Round 2</b>			
Solar PV <b>417MWp</b>	1.65	417	2.26
Onshore Wind <b>559MWp</b>	0.9	559	1.03
<b>Round 3</b>			
Solar PV <b>435MWp</b>	0.99	435	1.89
Onshore Wind <b>787MWp</b>	0.74	787	0.81
<b>Round 4</b>			
Solar PV <b>813MWp</b>	0.79	813	1.50
Onshore Wind <b>1,362MWp</b>	0.62	1362	0.66
<b>Total Cumulative Round 1-4   Solar PV and Onshore Wind</b>			<b>1.00</b>
<b>Projected Rounds 5-9</b>			
PV	0.585	4416	0.90
Wind	0.580	4416	0.67
<b>Total Cumulative All in</b>			<b>0.78</b>

### The unravelling of the coal supply model

The symbiosis between the coal mining sector and Eskom is often under-appreciated. Eskom's current fleet is located near to large coal fields and was built to use low grades of coal and with operating lives linked to the proven reserves nearby. These collieries were mostly owned by the three mining majors, but Eskom would finance the development of the mines, in return for which they would provide the required low-grade coal, often via conveyor belts, directly to

<sup>2</sup> [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2424835](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2424835)

<sup>3</sup> [http://www.engineeringnews.co.za/article/medupi-power-station-project-south-africa-2019-02-08/rep\\_id:4715/compa ny:elb-2011-01-27](http://www.engineeringnews.co.za/article/medupi-power-station-project-south-africa-2019-02-08/rep_id:4715/compa ny:elb-2011-01-27)

<sup>4</sup> [http://www.erc.uct.ac.za/sites/default/files/image\\_tool/images/119/Papers-2019/Alt%20IRP%20final%2007022019\\_2.pdf](http://www.erc.uct.ac.za/sites/default/files/image_tool/images/119/Papers-2019/Alt%20IRP%20final%2007022019_2.pdf)

the power station on a fixed cost or cost-plus basis. The mines, however, retained the right to export higher grade coal through Richard's Bay.

These arrangements have started to unravel. The Central Basin coal reserves in Mpumalanga are depleting, the commercial viability of mines is declining, and remaining reserves are now of too poor a quality, necessitating greater reliance on other types of procurement based on spot prices rather than the cost-plus basis. And, with these short term coal contracts come increasing transport costs: in 2007, only 14 per cent of Eskom's coal supply was delivered by trucks, by 2015, the figure was 30 per cent. This has raised costs of supplying the power stations significantly.

In addition, the aggressive manner in which Eskom has pursued procurement from black-owned suppliers has raised costs. Even if this were to be discontinued, as Eskom's new management have suggested, it has already resulted in an accelerated retreat by mining majors from coal. Traditional funders of coal assets have also retreated, making capital-raising for new projects less certain and more costly. Indeed, a number of banks have said that they will not be funding new coal mines in the future.

Kusile demonstrates the problem. Delays in securing a long-term agreement with Anglo American, the former owners of the New Largo coal field that was expected to supply the station, resulted in Eskom's signing medium-term contracts for the station's first few years of operation, contracts that must cover transport costs. Eskom sought to finalise long-term supply contracts with New Largo's new owners in 2018, but, as a result of financing challenges, it seems that a smaller version of the mine will be developed and will only be able to supply half of Kusile's requirements. This leaves a substantial residual volume of coal to be transported in from elsewhere. Because this was not part of the original plan, Kusile does not have the facilities to deal with the resultant congestion, stockpiling and blending of coal. To adapt, it will need additional investment to build the required infrastructure.<sup>5</sup>

## Suggestions for Generation

Eskom's unbundling will shed more light on its inner workings. The following points offer suggestions relating to the generation subsidiary which can be implemented in the short, and medium to long terms.

### Short term

#### Regularise coal contracts at power plant level

A key cost driver has been the rising costs of coal supplied to Eskom. Eskom should be compelled to publish full details of every coal contract it has and is planning to enter into. This should be done for every power station and for every future contract (which must be executed on strictly to agreed terms). Eskom should never buy coal from intermediaries or traders, only directly from mines.

Each power plant needs to determine the amount of coal that can be delivered by collieries without requiring road transport and the available coal resource (number of years of remaining supply at the quantity and quality). If collieries might require additional capital investment to extend their lives, this too should be calculated and disclosed. A decision on who should provide the capital and on what terms can then be taken. Information on stockpiles and outcomes of compliance testing should be published every day for every power station.

### Skills audit

There have been allegations that hastily implemented employment equity policies resulted in the departure of people whose skills and experience are needed to run its power plants. A skills audit must establish the extent of the skills gap for every power station.

### Optimise the decommissioning schedule

Many stations require substantial investment in refurbishment, but any decision on how to move forward must be based on a detailed understanding of each station's operating and maintenance costs, along with any additional investment needed to keep them going. This should include the costs of improving air quality to achieve statutory levels. This

<sup>5</sup> [http://meridianeconomics.co.za/wp-content/uploads/2017/11/Eskom-s-financial-crisis-and-the-viability-of-coalfired-power-in-SA\\_ME\\_20171115.pdf](http://meridianeconomics.co.za/wp-content/uploads/2017/11/Eskom-s-financial-crisis-and-the-viability-of-coalfired-power-in-SA_ME_20171115.pdf)

exercise will inform a decommissioning schedule based on full costs of producing energy at each station over the course of its lifetime.

Further optimisation is possible: each of Eskom's power stations is a bespoke build made up of six or more largely independent generating units. Instead of decommissioning at a power station level, decommissioning might be reprioritised at a unit level, with decommissioned units becoming a source of spare parts for the remaining units. The reduced generating capacity at any one power plant due to unit decommissioning would also permit the discontinuation of the most expensive coal supply contracts to that particular power station.

The outcome of the above analysis may have a substantial impact on Kusile. It might be preferable to discontinue the completion of its last two generating units so that expensive investments in its closest coal supply need not be made.

### **Medium to long term Debt and government's funding support**

Although there may be a temptation to spread Eskom's debt across the newly created subsidiaries, this should be avoided. Most of the debt was created in generation, and it is there where it should remain (even if the actual obligation to service the debt would remain with Eskom Holdings). If government is to provide on-going support for debt service costs, it should be directed at this subsidiary.

### **Decentralise authority to power stations**

A Chief Operating Officer should be appointed for each power station, responsible for all daily operations including budgeting, coal procurement, refurbishment and maintenance. They should be remunerated against agreed and strictly enforced performance targets.

Given the ambit of the responsibility and the strictness of the performance targets, the COO should have the right to appoint the management and technical/engineering team.

### **Rightsize staff complements**

Including Medupi and Kusile, the generation division employs just short of 8 000 people. The optimised decommissioning schedule will require some level of retrenchments which can be undertaken over time, but retrenchments in the generating subsidiary of Eskom should be substantially fewer than in Eskom Holdings or the other subsidiaries.

### **Re-establish the internal market and attract private investment**

During the process of getting the now-shelved Independent Systems and Market Operator (ISMO) Bill through parliament in 2012, Eskom implemented a comprehensive internal market where each generator would bid to supply energy based on its individual cost structure. This process determined the dispatch order for different generators such that overall costs were minimised. This model could be revived, and could form the basis for the recapitalisation of the generation subsidiary by selling all or some of the equity in specific power plants against a specific Power Purchase Agreement (PPA).

### **Consider a renewable energy division within Eskom**

Most energy planning shows that renewables should replace retiring capacity. The politics of this are complex because those most affected will be Eskom employees and workers in the Eskom supply chain. At the same time, a perceived conflict of interest has meant that Eskom has not been permitted to develop its own renewable energy capacity. With the unbundling this might be changed.

In addition, Mpumalanga should be declared a renewable energy development zone (REDZ). Just to replace Eskom's capacity would require between 2 000MW and 3 000MW per annum of new-build wind and solar photovoltaic (PV). Rights to develop this capacity could be allocated to a combination of Eskom, trade unions, and local communities. This would create more relatively well-paying jobs than currently exist. An energy transition like this would also attract international funds that are mandated to invest in clean energy.

## Transmission

The function of a transmission system is to transport power from the point of generation to the location of the load. Eskom's transmission grid has been built up in a highly centralised way around its generating assets, many of them in Mpumalanga.

After the unbundling of Eskom, the transmission subsidiary will operate the national grid, the storage (pumped water storage) facilities, and the "peaking plant" i.e. the gas/diesel turbines. It will be responsible for the external tariffs paid by Eskom's existing customers, its direct large customers, the distributors, and Eskom's own retail/residential customers. The critical change, however, is that, as an independent grid operator, Eskom transmission will, for the first time, have the benefit of price signals when making investment decisions.

### Setting an efficient price for electricity

Electricity is a highly capital-intensive industry. Eskom has traditionally addressed itself to the challenge of supplying energy at times of peak demand by over-investing in baseload capacity like coal fired plants or nuclear reactors that are not designed to ramp up or down. This led, conversely, to under-investment in more flexible power generating capacity designed to meet the peak. Building and maintaining excess baseload capacity to deal with peak demand means selling electricity at average lower price while ensuring that the system runs at higher average costs. Part of the reason for all of this was that Eskom, as a vertically integrated utility, can trade off generation and transmission investment decisions.

Efficient pricing requires identifying periods and locations where demand is tight or constrained, providing the (relatively expensive) peaking power, and charging those customers responsible for the excess demand a higher price. Other than in the case of chaotic load shedding, there has been little or no

incentive on the part of Eskom to make investments in or promote energy efficiency and demand response.

### The development of the national grid

Roughly speaking, South Africa's grid transmits energy generated in the north-east to the rest of the country.

While most of Eskom's existing generation capacity is geographically determined by where coal fields are located, renewables can be and are more spatially dispersed. Suitable connection points for renewables in the REDZ are becoming increasingly saturated. This results in grid congestion at connection points and delays in connecting renewable projects.<sup>6</sup> Projects outside the REDZs, and closer to the main urban areas, could be connected immediately. In addition, locating renewable power plants located on disused coal mines or next to retired power stations would allow far more renewables to be introduced immediately.

### Renewables and the national grid

The ability of any grid to integrate variable renewable energy depends on a number of factors, and in the past it was feared that a high share of variable generators might destabilise a transmission grid.<sup>7</sup> The German experience has shown, however, that a grid powered by a multiplicity of small, decentralised wind and solar generators does not necessarily mean a greater risk of outages. It is also possible that South Africa does not need as much additional peaking plant as some fear: a CSIR study suggests that the generating profile of renewable sources of energy aligns well with existing patterns of demand across the day, which would mean that higher penetration of renewables may be possible without necessitating much more peaking capacity.<sup>8</sup>

### Required investment in the national grid

South Africa's transmission grid is roughly 35 to 40 years old and refurbishment is overdue. Eskom's existing ten-year transmission capital expenditure programme called for R163 billion in spending

<sup>6</sup> Smit, Riaan (Eskom) Grid connection of renewable energy IPPs: Lessons learned <http://www.ee.co.za/wp-content/uploads/2015/06/Energize-RE-Vol-3-june15-p24-28.pdf>

<sup>7</sup> <http://instituteeforenergyresearch.org/analysis/germanys-green-energy-destabilizing-electric-grids/>

<sup>8</sup> [https://researchspace.csir.co.za/dspace/bitstream/handle/10204/10636/Calitz\\_21959\\_2019.pdf?sequence=1&isAllowed=y](https://researchspace.csir.co.za/dspace/bitstream/handle/10204/10636/Calitz_21959_2019.pdf?sequence=1&isAllowed=y)

between 2015 and 2024. This includes R146 billion required for capacity expansion, including 13 396km of new transmission lines and 81 385 MVA of additional transformation capacity. As a direct consequence of Eskom's financial constraints (which have seen Medupi and Kusile swallowing up more and more resources), the Transmission Development Plan (TDP) for that period, has been "re-phased and reprioritised". This means it will take longer to achieve the levels of network redundancy and reliability of supply as demanded by the South African Grid Code.

The separation of the transmission grid is an opportunity to alter the trajectory of future capital expenditure towards a smarter grid that can integrate far higher shares of renewables.

## Suggestions for Transmission

The separation of the national grid from the rest of Eskom creates a huge opportunity for South Africa. But the full benefits of unbundling will not be realised unless the relationships between Eskom's transmission and generation subsidiaries, on one hand, and, on the other, between the transmission subsidiary and the grid's customers, are fully transparent. Apart from anything else, improved transparency will help minimise political difficulties with the unbundling: with more transparency, citizens will be able to see what is going on and will be better equipped to resist the conspiracy-mongering of vested interests.

### Don't load transmission with debt and staff

Current estimates suggest that the grid will need a total investment of R165 billion over the next decade. This is a large capital outlay, and it will be difficult to finance if the subsidiary already has significant levels of debt.

The transmission subsidiary will correctly be seen as Eskom's core and as a result, there will be a temptation to assign excess staff, particularly staff presently working in Megawatt park, to the transmission subsidiary. This too should be avoided, as increased costs at the centre will necessitate higher electricity charges.

## Maximise autonomy and pricing under clear regulation

The unbundling of Eskom provides an opportunity to rethink tariff setting. Instead of the full asset base being subject to the multi-year price determination (MYPD) process, in future, the much smaller asset base of the transmission subsidiary would fall under Nersa's permitted return-on-assets pricing methodology. This is far preferable to tariff setting that appears to have become a negotiation rather than a technical process of determining the tariff.

The transmission subsidiary should therefore become a fully-fledged Independent System Operator (ISO) as soon as possible. It should be granted maximum autonomy to negotiate all future PPAs from Eskom's generation subsidiary, preferably at power plant level. In time, the PPAs with Eskom's generation subsidiary or individual generators should be based on their despatch order, optimum load profile and tariff.

Care should be taken to avoid using transmission subsidiary's own generating capacity, particularly the gas/diesel turbines to meet shortfalls unnecessarily. Every effort should be directed at making distributors responsible for meeting peak demand using generating capacity within the distribution networks. To the extent that peaking capacity must be used, pumped storage should be used first, before gas and diesel turbines are fired up.

For customers, tariffs should reflect the cost of electricity during different times of the day, and tariffs should encourage demand response and load shifting wherever possible, with prices rising and falling with demand. Subsidies, to the extent that these are retained, ought to be calculated and disclosed.

### Align a future gas IPP with the actual requirements of an ISO

The much-delayed gas IPP ought to be aligned with the requirements of the electricity system as a whole. Gas IPPs should be contracted only when the requirements of the whole system as identified by the ISO becomes clearer. Once they are brought on line, gas IPPs should be directed at providing peaking capacity and only to the extent that it is absolutely

necessary. Much depends on the gas import, storage and pipeline infrastructure that would be required, however.

## Distribution

Before 1994, municipalities distributed electricity in historically white areas, while Eskom covered historically black townships and some of the former so-called homelands. As a result, there are more than 150 licensed electricity distributors in South Africa. This sector is set to change most in the future as new (peer-to-peer electricity trading) and new-ish technologies (rooftop PV) come on stream or diffuse.

Typically, distribution networks in South Africa have had a very simple business model. They are responsible for customer management and the maintenance of infrastructure. They have also only had one supplier, Eskom, whose electricity was sold at a 30 per cent mark-up. The future will be different.

Distributors will face a very differently structured tariff in the future with greater differences in the cost of electricity at different times of the day. Distributors with the largest customer bases are best placed to deal with the changes in the system and the increased complexity of electricity distribution. As such, Eskom's distribution subsidiary, the largest single distributor, will undergo extensive change.

### The crisis in the distribution sector

The distribution sector has many players and stakeholders across all spheres of government and across multiple departments, so fixing it requires strong political support.

At the end of 2018, municipalities owed Eskom over R17 billion and Soweto residents, serviced by Eskom itself, collectively owe more than R15 billion.

Nersa, which audits distributors, has noted a progressive deterioration of plant amongst many of the distributors, particularly the smaller municipalities. It reports that funding and skills are the key challenges. Similarly, the Financial and Fiscal Commission (FFC) reports that for at least seven years, municipalities have only spent 60 per cent of

the benchmark for maintenance across all municipal infrastructure, of which R10 billion per annum is for electricity infrastructure. All of this points to a lack of institutional capacity as a major cause of the maintenance backlog.

Eskom's own distribution networks, like its transmission network, have suffered from under-investment and inadequate maintenance. Also, a significant amount of electricity is lost due to "non-technical losses" (i.e. theft).

## Suggestions for Distribution

### Rationalisation of distributors

Another effort at rationalisation is needed. Electricity distributors need to be ring-fenced, corporatised, effectively regulated and well-managed utilities, with adequate investment in physical and human capital. If this were to occur, large corporatised muni-distribution companies could take over Eskom's distribution assets, staff and systems within municipality boundaries. Existing debts will have to be carefully managed: Johannesburg's metro budget cannot absorb Soweto's debt to Eskom. More generally, because Eskom distributes to poorer customers and metros would not want to absorb a loss-making activity, government subsidies (such as support for the free basic electricity allowance) would need to be transferred along with the customer base.

Eskom's remaining distribution business would have customers that were predominantly rural and small town in nature. That capacity could be carved into a series of regional distributors, some of which would absorb poorly performing local government distributors, especially those who are not meeting their financial obligations to Eskom. Alternatively, defaulting municipalities might be obliged to contract an Eskom regional distributor to run its electricity network for it.

For the model to work, amendments to the Municipal Finance Management Act and the Municipal Systems Act may be needed. A clear division of roles and responsibilities would need to be established: Nersa's responsibility for setting tariffs and service



standards; the municipality's role as the owner of assets; and the municipality's political role in relation to electrification and subsidies. In this process, Eskom (or other) regional distributors would be paid a fee according to a service level agreement.

### Ringfencing distribution and private participation

It is clear that there are insufficient funds to clear distribution backlogs. Further, there are insufficient skills to allocate, prioritise and prudently invest in electricity, even if funding were available. Where substantial capital backlogs exist, distributors should look to the private sector. This is facilitated by the existing requirement that municipal distributors ringfence their electricity distribution businesses. All of which makes it possible to imagine a programme of private sector involvement modelled on the renewable energy independent power producer procurement programme (REIPPPP), which has amply demonstrated that private capital is available for electricity provided there is assurance on capital recovery. Wherever possible, the Department of Energy should run a procurement process to involve private sector service providers with tenderers providing specific responses to key issues such as sources of skill, capital requirements, billing, prepayments and cash management.

### Passing the costs of inefficient electricity use on to customers

Distributors can employ two strategies to mitigate the negative financial impacts of embedded generation: grid charges and time-of-use metering. Some of them are already implementing these measures.

**Grid charges:** When less electricity is purchased through the distribution network, the effect is to increase the cost of the 'grid' (fixed costs) per unit of electricity sold. Implementing a grid charge can mitigate this effect. However, high grid charges encourage consumers to leave the grid entirely, particularly when load-shifting options become more economical (through reduced battery storage costs, for example).

**Time-of-use metering:** When a household uses rooftop PV and remains tied to the grid, the effect is to load-shift the demand from grid-electricity towards

the peak periods. Time-of-use pricing (charging customers different rates for different times of the day) can be used to ensure the costs of peak usage are recovered.

If local government/electricity distributors can encourage changes in residential customer behaviour by moving to time-of-use pricing then profitability increases even as less electricity is consumed. Customers are incentivised to reduce peak-time demand when rates are higher and defer usage for cheaper time slots instead. In essence, the cost of inefficient electricity usage shifts to the customer.

### Subsidies for the poor

A large proportion of households receive a subsidy for the use of small amounts of electricity but there is very little transparency about the scale and distribution of costs and benefits.

While cross-subsidies are important for equity reasons, they have to be weighed up against the extra costs imposed on the system as a result of the inefficiencies. Cross-subsidies in electricity tariffs should be levied transparently, and distributors should publicise details of cross-subsidy between customer categories. Prices by distributors should identify the efficient prices, and only then decide what cross-subsidies should be added.

Cross-subsidies intended as redistributive or poverty alleviation policies represent redistributive expenditure which is a National Treasury function. They should not be carried by distributors themselves.

## Concluding Remarks

Eskom faces enormous challenges, both in the short-term, and the medium to longer terms. In the short-term, it needs to lighten the burden of its perpetual liquidity crisis. In principal, this should have been partly addressed by the R23 billion-a-year in additional support that Eskom received from National Treasury this year, but because Nersa saw this as new income and moderated the tariff increase accordingly, it has done no such thing. Addressing this is the highest order priority: if Eskom were unable to service its debts, the impact on government's creditworthiness

could be significant. The same would be true if it were unable to meet commitments to suppliers or make payroll.

Fixing this is, of course, not easy: Eskom's income does not cover all its expenses, especially when it has to run its most expensive diesel-fired generators because of problems elsewhere in the fleet and/or when it must engage in emergency repairs and maintenance. Nor is it easy to lower other costs (staff and materials) or to increase revenues either by selling more electricity (because the capacity does not exist) or raising tariffs (because the regulator has been unsympathetic to its financial woes, and because higher prices drive more customers off the grid).

In the long-term, Eskom's challenges are subordinate to a wider challenge of how South Africa is to ensure

that it can provide as much electricity as it needs for households and businesses, and to do so reliably, cheaply, cleanly and in an environmentally sustainable manner. There is no doubt that the only way to do this is to undo the vertically integrated monopoly, separate generation, transmission and distribution, and to make maximum use of competitive market forces to achieve this. Fortunately, rapid technological change and sound regulation makes this possible, though South Africans should be under no illusions that this will be cheap or that it will happen quickly: Eskom's challenge, and, by extension, those of the energy sector as a whole, are not the result solely of the corruption of state capture, but have built up, more and more rapidly, over decades. Unwinding this is not the work of a day, but with sensible policies and some new investment, significant improvement can be achieved.



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Published in June 2019 by the Centre for Development and Enterprise  
5 Eton Road, Parktown, Johannesburg 2193, South Africa | PO Box 72445, Parkview, 2122  
Tel +27 11 482 5140 | [info@cde.org.za](mailto:info@cde.org.za) | [www.cde.org.za](http://www.cde.org.za)