

POWERING DEVELOPMENT

A PATHWAY TO INTEGRATING
ROOFTOP SOLAR PV INTO
MUNICIPAL ELECTRICITY
DISTRIBUTION



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JULY 2026

Lead author: Tracy Ledger

Research Team: Tracy Ledger, Clyde Mallinson (Sizana Consulting)

Photographs: Bram Lammers

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UNIVERSAL ACCESS TO ELECTRICITY IS KEY TO EQUITABLE SOCIOECONOMIC DEVELOPMENT

1.1 Electricity supports multiple development goals

Universal access to reliable and affordable energy is the great enabler of socioeconomic development, facilitating both higher standards of living and higher levels of economic activity. The general consensus is that increased electricity consumption is an essential pre-condition for improving quality of life. The World Bank is clear that 'access to energy is at the heart of development', and that lack of access poses 'a key barrier to economic development'.¹ **Research suggests that households that have access to electricity are more likely to establish a small business enterprise than those who do not.**² Access to electricity is necessary for a vast number of economic activities: when households and small enterprises have access, they can engage in a wider range of economic activities, particularly higher value-added activities. Increased economic opportunities created by access to electricity drives increased employment and higher household disposable income and expenditure, which reduces both poverty and inequality. There is thus a significant positive relationship between increased electricity consumption and increased economic growth.³

In contrast, studies focused on South Africa have found that constrained access to electricity is strongly associated with declining economic activity.⁴ The devastating economic impact of insufficient electricity and an unreliable supply was well illustrated during South Africa's extended period of load shedding that ended in 2024: it is estimated that from 2020 to 2023, load shedding subtracted a cumulative 15 percentage points from GDP growth.⁵ Additionally, approximately 800,000 existing jobs were lost due to load shedding, with many more potential employment opportunities never created.⁶

South Africa's National Development Plan (NDP) identifies electricity supply and cost as critical binding constraints on economic growth. The NDP prioritises increased infrastructure investment in key sectors – electricity, transport and water – as essential building blocks for increasing long-term development potential.

The 7th Sustainable Development Goal (SDG) is to 'ensure access to affordable, reliable, sustainable and modern energy for all'. In addition to comprising a standalone global goal, universal access to energy is closely linked to attaining many of the other SDGs – eradicating poverty, improving food security, addressing climate change and improving health outcomes.⁷

¹ World Bank Group, 'Access to Energy is at the Heart of Development', 18 April 2018.

² Prasad, G. and S. Dieden (2007) 'Does Access to Electricity Enable the Uptake of Small and Medium Enterprises in South Africa?'. International Conference on the Domestic Use of Energy. Cape Town: University of Cape Town.

³ Ateba, B.A., J.J. Prinsloo and R. Gawlik (2019) 'The Significance of Electricity Supply Sustainability to Industrial Growth in South Africa'. Energy Reports 5: 1324–38.

⁴ Ibid.

⁵ Walsh, K., J. Nel and J. Kiln (2023) 'Re-estimating the Economic Cost of Loadshedding in South Africa'. Economics Society of South Africa Conference Report. Stellenbosch: Nova Economics.

⁶ *Daily Investor*, '800,000 South Africans can lose their jobs due to load shedding', B. Neethling, 5 December 2023.

⁷ Sarkodie, S.A. and S. Adams (2020) 'Electricity Access and Income Inequality in South Africa: Evidence from Bayesian and NARDL Analyses'. *Energy Strategy Reviews* 29: 100480.

1.2 South Africa needs more electricity, more reliable electricity and cheaper electricity to support equitable development

The socioeconomic development benefits that can be facilitated by electricity will only materialise if electricity consumption increases in South Africa – if more households and enterprises use more electricity to increase standards of living and to engage in more economic activities. **Increased electricity consumption requires both increased reliable supply and lower tariffs to make usage affordable for all users.**

We need to significantly increase electricity consumption to support development

Increased consumption of electricity is key to socioeconomic progress: the different economic development trajectories of Southeast Asia and Africa indicate very clearly the impact of the failure both to rapidly increase electricity supply and to create an enabling environment for households and businesses to use more. In 1990, per capita electricity consumption in Africa⁸ was 40 per cent **higher** than in Southeast Asia; by 2023 it was 70 per cent **lower**.⁹ The rapid increase in electricity consumption has supported strong growth in Southeast Asia – way above that of Africa – resulting in significant reductions in poverty levels.

In South Africa, electricity consumption per capita declined by 26 per cent from 2000 to 2023,¹⁰ the opposite of what is needed to support socioeconomic progress.¹¹ In a developing country context, declining per capita consumption usually reflects supply¹² and/or affordability constraints. Over that same period from 2000 to 2023, per capita electricity consumption in China increased by 489 per cent,¹³ and is now 61 per cent higher than in South Africa.

The key contributors to declining per capita electricity consumption in South Africa were:

- i. Limited growth in supply: Total electricity production increased by 9 per cent from 2000 to 2023, while the population grew by more than 30 per cent; and
- ii. Rising unaffordability of electricity (discussed in more detail below).

Per capita data probably obscures a more significant deterioration in the **equitable** distribution of electricity consumption: given that poorer households and small and micro enterprises are least able to cope with unreliable supply and rapidly rising electricity costs, it is likely that the decline in electricity consumption has been concentrated in these groups. The implication is that **the current structure of electricity supply is exacerbating inequality.**

In order to rapidly increase development, and create large numbers of employment and livelihood opportunities, South Africa requires electricity supply (i.e. power available to users) that is some 35 to 50 per cent higher than current levels, by 2030. This additional supply cannot be provided by Eskom's current aging coal-fired generation fleet. Significant delays in building new transmission grid capacity implies that much of the new grid-scaled renewable capacity may not be able to address this entire supply requirement within the next few years.

⁸ Which consumption was dominated by South Africa.

⁹ IEA (2024) 'Electricity 2024: Analysis and Forecast to 2026'. IEA Report. Paris: International Energy Agency.

¹⁰ IEA (2023) 'South Africa / Electricity'. Web post. International Energy Agency.

¹¹ Although this could be attributed to load shedding, the end of load shedding has not seen a significant recovery in electricity consumption due in part to significant cost increases for most consumers.

¹² In a developed country context, a decline in per capita consumption may indicate increased energy efficiency and/or a shift towards less energy intensive industries such as services.

¹³ IEA (2023) 'South Africa / Electricity'. Web post. International Energy Agency.

Electricity distribution network reliability needs to be increased

Network reliability is an important factor supporting the positive and equitable economic development impact of electricity: users need to be able to access a minimum quality of supply, whenever they require it, to maximise its benefits. Poorer households and smaller enterprises are least likely to be able to compensate for interruptions in – or poor quality of – supply, which means that **poor electricity network quality has a negative impact on equity.**

Although load shedding is officially over (for now),¹⁴ **power system outages are still a regular occurrence across many areas.** There is no central database of these outages across all municipalities and Eskom, but the company Wetility Energy compiles data¹⁵ based on system outages recorded by a sample of behind-the-meter solar systems. It should be noted that their data probably **under-records** outages, given that solar installations are concentrated in higher-income urban areas. Therefore, outages in rural and urban low-income areas are probably under-represented. That is, the actual situation is most likely **worse** than Wetility's data suggest. It should be noted that this outage data covers both Eskom-supplied and municipal-supplied areas, since distribution is a shared function in many areas. However, in light of other outage studies (such as that referenced for Johannesburg below) together with the fact that Eskom's urban household customers are predominantly township residents (who are less likely to have the resources to install a behind-the-meter solar PV system) we could make the assumption that the Wetility data largely reflects **municipal** outages.

Wetility's findings for 2025 can be summarised as:

- An average of six to nine outages per household per month;
- 58 per cent of outages (66 per cent of outages in Gauteng) last more than eight hours;
- Gauteng recorded the worst performance, with an average outage of 14 hours. (Since this is where South Africa's economic activity is concentrated, this is a particularly concerning situation.)

A 2025 investigation into City Power (Johannesburg) calculated almost 100,000 reported outages over a nine-month period, with more than 5,000 of these being medium- or high-voltage outages, which affected large areas.¹⁶ The investigation further concluded that medium- and high-voltage outages were becoming more frequent in Johannesburg, meaning that over time, more and more users are being negatively impacted.

The main reason for unplanned municipal outages is aging and poorly maintained infrastructure. In turn, this largely reflects inadequate expenditure on maintenance and asset renewal over the past 20 years.¹⁷ There is now an enormous maintenance and capital expenditure backlog across local government, with no clear plan for how this growing problem is going to be addressed, given the poor financial status of many municipal electricity utilities. Unless this backlog can be addressed and infrastructure quality improved, the most likely medium-term outcome is that unplanned electricity outages in many areas will increase in both frequency and duration with significant negative impacts on local economic development and equity.¹⁸ **The backlog cannot be addressed unless municipal electricity distribution is able to generate sufficient surpluses** to fund additional infrastructure expenditure.

¹⁴ Concerns have been raised that load shedding could return in 2029 unless significant new power supplies are added to the system – MyBroadband 'Alarm bells about the return of load shedding in South Africa', M. Illidge, 1 March 2026.

¹⁵ Wetility (2025) 'Electricity Outage Map: Check Power Outages in Your Area'.

¹⁶ *Daily Maverick*, 'Joburg Power Crisis – Almost 100,000 reported outages in 9 months', F. Haffajee, 15 July 2025.

¹⁷ Vandalism and illegal connections also damage infrastructure, resulting in unplanned outages, but this is a less important factor than the impact of decades of under-investment in maintenance and asset renewal.

¹⁸ Since lower-income households and small enterprises are the least likely to be able to afford backup supply.

Electricity is unaffordable for a growing percentage of households and small enterprises

Economic growth and social development not only require sufficient and reliable electricity (which we do not have), but also that it is affordable – for households and for enterprises. **Unaffordable electricity tariffs effectively limit the growth of small and micro enterprises and discourage the establishment of new enterprises.**¹⁹ Expensive electricity results in self-rationing in poor households that undermines development. Research shows that low-income households routinely sacrifice basic food expenditure to pay for electricity (ibid). As a result, **high electricity tariffs undermine a range of national development goals – food security, employment and small business development.** High tariffs also encourage illegal connections, which increase electricity losses for distributors and often damage infrastructure, exacerbating the maintenance backlog.

While the per capita supply of electricity has been declining, electricity tariffs have increased significantly over the past 20 years, way above the increase in inflation or average wage increases. Recent financial data indicates that Eskom is recording significant increases in revenue, despite a declining volume of electricity supplied. That is, **Eskom is supplying less electricity at a significantly higher price.**²⁰ The current regulated method for setting electricity tariffs – both for municipal customers and Eskom customers – is directly tied to Eskom’s costs, which have been hugely inflated by years of mismanagement and corruption. **As a result, household electricity costs have consistently increased by several multiples of inflation²¹ and have far exceeded average wage increases.**

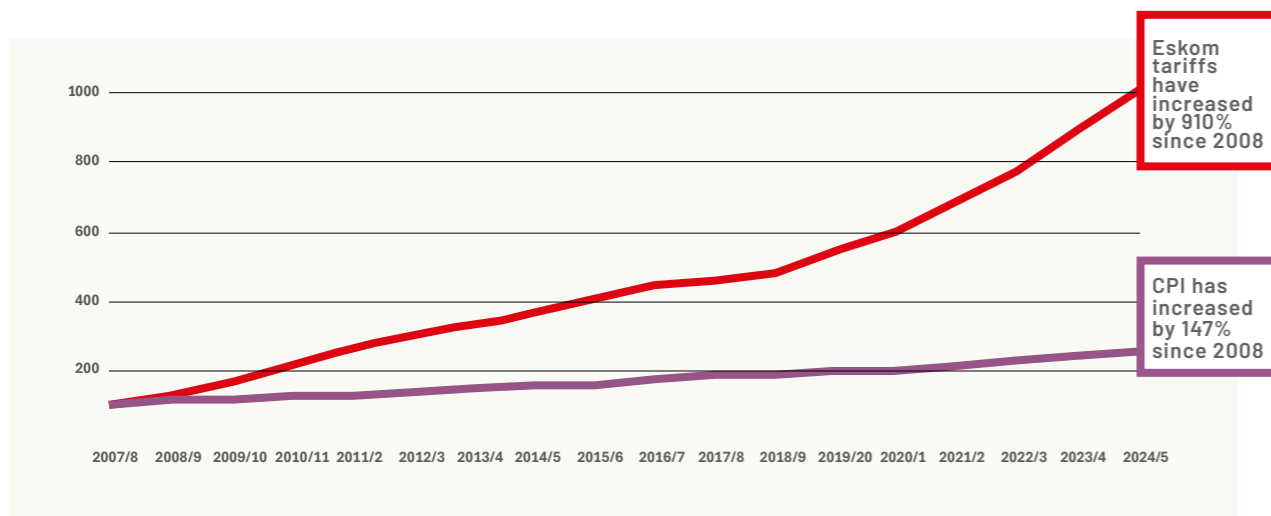


Figure 1: Eskom Tariff Increases Versus Inflation (2008 – 2025)

Source: Local Government White Paper Review

¹⁹ Ledger, T. and M. Rampedi (2022) *Hungry for Electricity*. Johannesburg: Public Affairs Research Institute

²⁰ *Business Tech*, 'Eskom selling less electricity but raking in billions in profit', 24 March 2026.

²¹ *News24*, 'SA faces municipal electricity hikes 4 times above inflation: How to fight back with solar', 30 June 2025.

A recent empirical analysis of the affordability of tariffs relative to household income²² showed that even very small amounts of electricity are unaffordable for the approximately 7.5 million South African households that live at or below the minimum wage. **Unaffordable tariffs impact poor households and micro enterprises the most:** high electricity costs reduce the amount of electricity that people can use to improve their standards of living. Rapidly rising electricity prices increase the cost of running a small enterprise, over and above the strain caused by more frequent outages.

High tariffs also create effective barriers to small entrepreneurs who want to expand their businesses or to engage in additional value-added activities – most of which require electricity. In this way, **expensive electricity contributes directly to both poverty and inequality.**

Rising electricity costs have additional **indirect** negative impacts on poverty because it is an input into the production of so many other goods and services. For example, high electricity costs have contributed to the rising cost of water, since electricity is a key input into water distribution services.

In summary, significant economic growth, job creation and poverty reduction in South Africa are critically dependent on achieving the following outcomes:

- A substantial (30 to 50 per cent) increase in the supply of electricity available to users over the next five to ten years. However, there are significant limits to that supply being produced by the existing Eskom coal fleet, which is currently operating very close to its maximum efficiency. In addition, several of the oldest coal-fired stations are due to be retired in 2030. Although there has been significant investment in new renewable capacity by non-Eskom entities, delays in extending the transmission grid, together with the required scale of that transmission build, are likely to limit how much new supply will actually reach end users over the next five years. Now that load shedding is over, the biggest long-term threat to energy security in South Africa is (usable) generation capacity.²³
- A significant improvement in the reliability of electricity supply, particularly in large urban areas (such as much of Gauteng). This will require a significant increase in maintenance and asset renewal expenditure and that, in turn, requires that municipal distributors earn a higher surplus on the sale of electricity.
- Electricity needs to become cheaper in real terms for all users: for increased electricity supply to support more equitable development, it must be affordable. **This means that the additional surplus required to fund infrastructure cannot come from higher tariffs.** Increased supply at generally unaffordable tariffs will have some positive development impact, but that impact will be far smaller than what could be achieved with lower prices. However, the pricing trajectory of Eskom (from which municipalities source almost all their bulk supply) is still firmly upwards and well above inflation. Although **renewables are significantly cheaper than the electricity produced by Eskom**, delays in grid expansion have limited the amount of renewable generation that can reach end users, limiting that potential positive impact on tariffs.

The only way all three goals can be achieved simultaneously is if municipal electricity distributors are able to access additional supply at a cost significantly lower than current bulk costs. This will allow for greater surpluses to address maintenance backlogs while still limiting real electricity price increases.

²² Ledger, T. and N. Mathibela (2025) 'Affordability of Basic Services for South African Households'. PARI Report. Johannesburg: Public Affairs Research Institute

²³ OECD (2025) 'OECD Economic Surveys: South Africa 2025'. Paris: OECD Publishing.

1.3 Municipal distributors are key to achieving these outcomes

Electricity distribution to end users is a function divided between Eskom and local government, which owns and operates approximately half of South Africa's electricity distribution grid, through 165 municipalities²⁴ that supply electricity to approximately 60 per cent of all end users.²⁵ Distribution is, however, concentrated in relatively few municipalities: five metros account for 63 per cent of municipal electricity sales and some 20 municipalities account for almost 90 per cent of total sales.²⁶

Many municipal distributors are not meeting the requirement of reliable and affordable electricity and most municipal electricity distribution is in a poor state – both financially and operationally. Municipal electricity tariffs have risen well above inflation for the past 15 years, driven mostly by Eskom price increases, which have significantly increased the cost of supply for municipalities. This means that higher tariffs have generally not translated into increased surpluses for municipalities. This factor, together with poor management in many (albeit not all) municipalities, the past requirement to cross-subsidise other municipal functions from surpluses on electricity (rather than allocating these to maintenance)²⁷ and rising debt owed by customers, has pushed many municipal distributors close to both operational and financial collapse.

PARI research, illustrated in Figure 2 below, shows the aggregate financial position of municipal electricity trading from 2017 to 2024. Municipalities in aggregate have recorded a deficit in four of the most recent six years, with a cumulative deficit of approximately R24bn over that period. Given the additional recent above-inflation tariff increases awarded to Eskom,²⁸ we can expect that this deficit situation will continue.

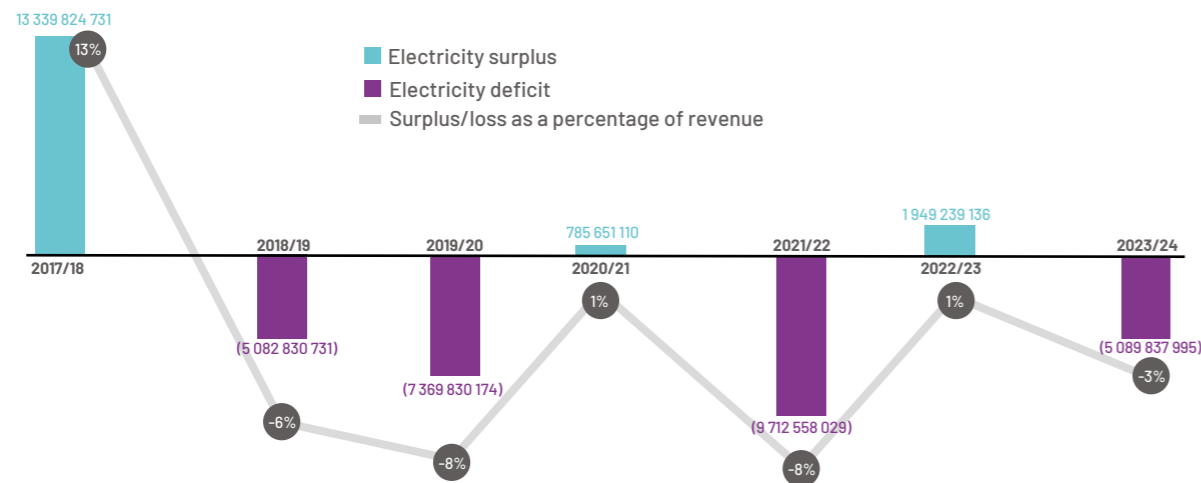


Figure 2: Municipal Surplus/Deficit on Electricity Services Trading

Source data: prepared by PARI for the Local Government White Paper review

²⁴ In terms of the Constitution, all municipalities are electricity service authorities, but there is a clear separation between authority and provider in terms of the legislation. Provider status is determined by the holding of a distribution license and, by implication, of meeting the requirements of that license. This chapter covers interventions to support the 165 authorised electricity service providers.

²⁵ Municipalities distribute less volume of electricity than Eskom because the latter has a small number of very large customers.

²⁶ Based on MFMA Section 71 data submitted by municipalities to National Treasury.

²⁷ Which to date has been an integral part of the local government fiscal framework.

²⁸ *Moneyweb*, 'Nersa's mistakes turn 5.36% tariff increase into 8.76%', A. Slabbert, 9 February 2026.

This financial reality of municipal electricity trading is an important reason why infrastructure renewal and maintenance have not been funded to the required level. The reforms proposed under Operation Vulindlela's utility model require that in future, all electricity income and expenditure be ringfenced away from general municipal expenditure. National Treasury's trading services reforms encourage and incentivise more prudent financial management and revenue collection.

However, the reality of:

- a sector already operating at a significant accumulated loss,
- the prospect of large bulk supply increases from Eskom continuing over the foreseeable future which reduces municipal surpluses, and
- a very limited ability of electricity consumers to absorb higher tariffs

indicate that these reforms are unlikely to reverse this position to the extent required to make municipal electricity distribution financially sustainable and to allow for the surpluses required to fund large increases in infrastructure expenditure.

We do acknowledge that there is also a scale/consumer profile challenge across smaller municipalities that have high percentages of low-income customers which suggests that electricity distribution is, in fact, never going to be financially viable in these areas. However, given that the 20 largest municipalities – by volume of sales – make up some 90 per cent of total revenue, Figure 2 above overwhelmingly presents the financial position of the biggest municipal distributors, including the metros.

The key policy challenges are how to simultaneously achieve lower real municipal tariffs for end users in the medium-term (which will support an increase in demand) and increase expenditure on infrastructure (which requires that municipalities earn a higher surplus).

The only way that these multiple goals can be achieved is if:

- New sources of significantly cheaper electricity are available as bulk supply to municipalities (in a manner that bypasses the current constraints set by the limits on new transmission infrastructure build); and
- If the cost of supplying electricity declines sufficiently to both increase the amount that can be allocated to infrastructure maintenance and renewal,²⁹ and allow space for lower tariffs in real terms.³⁰

This report presents a set of policy proposals for one option that could contribute to achieving these outcomes.

The key policy challenges are how to simultaneously achieve lower real municipal tariffs for end users in the medium-term (which will support an increase in demand) and increase expenditure on infrastructure (which requires that municipalities earn a higher surplus).

²⁹ Allowable tariffs charged by municipalities are based on cost of supply, of which bulk costs are the most significant component. However, existing regulation does allow infrastructure maintenance requirements to be included in those costs.

³⁰ Lower tariffs are one part of an affordability solution for very poor households. The other part is to improve the implementation of the Free Basic Electricity subsidy, and over time to increase its quantum.

The main reason for unplanned municipal outages is aging and poorly maintained infrastructure. In turn, this largely reflects inadequate expenditure on maintenance and asset renewal over the past 20 years.



CHAPTER TWO

ADDRESSING CURRENT CONSTRAINTS IN THE MUNICIPAL ELECTRICITY DISTRIBUTION SECTOR

The first part of this chapter presents a detailed analysis of the municipal electricity distribution challenges raised in the previous chapter:

- The rising cost of bulk supply; and
- The shortfalls in maintenance and infrastructure renewal funding.

These are the key factors that must be addressed to place municipal distributors in a better position to supply more reliable electricity at a lower real tariff.

The second part of this chapter presents a series of recommendations for how these challenges could be addressed by leveraging a renewables and BESS³¹ strategy off existing rooftop solar photovoltaic (PV) installations.

2.1. Rising bulk costs are driving unaffordable tariffs and reducing funding available for infrastructure

Municipal electricity tariffs are regulated by the National Electricity Regulator of South Africa (NERSA), Municipalities calculate the level of revenue required to cover the costs of delivering the service (which should be based on a cost-of-supply study that meets NERSA requirements), together with an 'appropriate' surplus margin. The basis of municipal tariff applications are thus detailed cost-of-supply calculations, which should include allowances for infrastructure maintenance.

The single biggest part of that municipal cost of supply is the bulk costs payable to Eskom, which – over the past ten years – have increased significantly above both inflation and minimum wage increases. As a result, **bulk costs as a percentage of municipal electricity revenue are increasing**, which means that each year there is less funding available for addressing the infrastructure backlog.

From 2022 to 2026, the Eskom bulk tariff to municipalities increased by approximately 60 per cent. Section 71 data show that in the 2024/25 financial year³² total bulk purchases of electricity (R145.3bn) made up 85.5 per cent of total revenue (R170bn). In the previous year³³ total bulk purchases of electricity by municipalities (R123.5bn) made up 83.6 per cent of total revenue (R147.7bn).

³¹ Battery energy storage system.

³² NT (2024) 'MFMA, Section 71 Information (In-year Management, Monitoring and Reporting): 2024/25, 4th Quarter'. Pretoria: National Treasury of South Africa.

³³ Ibid

A comparison of revenue and bulk purchases for 2024/25 indicates that municipal electricity distributors in aggregate had a gross surplus on electricity sales (i.e. what is left after paying Eskom for bulk costs) of less than R25bn to pay for all other costs associated with servicing – and maintaining the infrastructure that services – 60 per cent of all electricity consumers in South Africa.

The actual situation is even worse than these data suggest: revenue figures reflect billed revenue, not what is actually collected by municipalities. If municipalities collected 90 per cent of billed revenue of R170bn, then the gap between actual revenue and bulk costs would be less than R10bn, across all of local government.

Although there is no doubt that poor governance and management have contributed to the current dilapidated state of infrastructure in many municipalities,³⁴ the current situation with respect to bulk costs is clearly not compatible with a financially sustainable electricity distribution function able to deliver a high-quality service to all customers. It is also clear that rapidly rising Eskom bulk costs (which far exceed inflation) are not compatible with the more affordable tariffs that are required to support socioeconomic development.

Eskom's time-of-use tariffs (which impose a substantial surcharge on electricity supplied to municipalities during peak demand times – morning and evening) have been particularly onerous for municipalities as they are significantly higher than the average tariff, and higher than almost any tariff that a municipality could charge its customers. **The high demand peak tariff charged by Eskom to municipalities for the 2023/24 year was R4.79 per kWh, a cost far higher than the average charge levied by municipalities on their own customers.** As a result, municipalities are making a loss (and sometimes a significant loss, given that this is the period where the bulk of consumption is concentrated) on electricity sold during the peak charge times. Although it has been proposed that municipalities try to recover some of these costs by charging their own time-of-use tariffs, this would have a significant negative impact on the poorest households: the main source of electricity demand in low-income houses is for activities during the peak demand periods – getting ready for school and work in the morning and cooking in the evening.

Eskom's high demand peak tariff increased by a greater percentage (84 per cent) than the average tariff charged to municipalities over the period 2018/19 to 2023/24. We estimate that, **by 2030, the Eskom high demand peak tariff could be close to R9 per kWh.**

The most likely medium-term scenario of rapidly rising Eskom tariffs, coupled with the reliance of municipalities on Eskom as their sole provider, is declining local economic development, deteriorating financial sustainability of municipal electricity distribution, and deeper poverty and inequality.

2.2. Low levels of spending on maintenance and infrastructure renewal undermine financial sustainability and have created a backlog that cannot be funded under the current financial model

Underspending on maintenance and infrastructure renewal is an issue across municipalities, given that in general electricity distribution operates at a loss. The severity of the problem varies, depending in large part on how well the municipality manages revenue collection and expenditure and the demographic profile of residents, but almost every municipality faces an infrastructure funding shortfall. The result is that infrastructure is getting older and older, with some of the more expensive assets having an age above 50 years and the average asset being just over 30 years old.³⁵ Municipalities cannot afford to replace these old assets and this contributes to more frequent equipment failure. Section 71 data for the 2024/25 financial year indicated that **across local government**, only R7.3bn was allocated to capital expenditure for energy trading services.

³⁴ Specifically, many municipalities neglected infrastructure maintenance expenditure when bulk costs were significantly lower and allocated electricity surpluses to other municipal functions, a practice that was imprudent but not illegal.

³⁵ SEA (2024) 'Electricity Grid Sustainability: Consultation draft'. Report for the Presidential Climate Commission. Cape Town: Sustainable Energy Africa.

The high demand peak tariff charged by Eskom to municipalities for the 2023/24 year was R4.79 per kWh, a cost far higher than the average charge levied by municipalities on their own customers.



National Treasury guidelines are that asset renewal is around 2 per cent per annum, with higher allocations required to deal with backlogs. The current asset value of municipal electricity distribution is hard to calculate: in 2013 the Financial and Fiscal Commission estimated R400bn. Given the current age of infrastructure and the likely current value of assets, R7.3bn is clearly much less than what is required to ensure a robust and reliable distribution grid.

A report by the Development Bank of Southern Africa (2012) estimated that between 2013 and 2023, municipalities would require an investment of R176bn in electricity infrastructure (i.e. almost R18bn in average each year), 43 per cent of which would be required to rehabilitate existing infrastructure.³⁶ Actual expenditure has fallen far short of that estimate.

The underspending on asset renewal and maintenance has created an infrastructure maintenance backlog estimated to be somewhere between R150bn and R200bn. **This infrastructure expenditure requirement is roughly the same value as total revenue for the entire municipal electricity distribution sector in 2025. Unless municipalities can significantly reduce their cost of supply, they will never be able to earn a surplus sufficient to start addressing the enormous infrastructure requirements.** (Although we can never expect local municipalities to earn sufficient surplus to address the entire investment requirement including backlogs, reducing the cost of providing electricity will make an important contribution.)

2.3. Increasing the share of renewables and BESS will reduce bulk costs and increase operating surpluses

While the cost of the electricity supplied by the Eskom coal fleet rises, and will continue to do so for the foreseeable future, the cost of electricity generated by utility-scale solar PV is declining. Figure 3 below illustrates the Eskom average WEP tariff for a metro municipality, compared to the levelised cost of energy (LCOE) for wind and solar PV. It shows actual costs to 2026 and estimated costs to 2030.

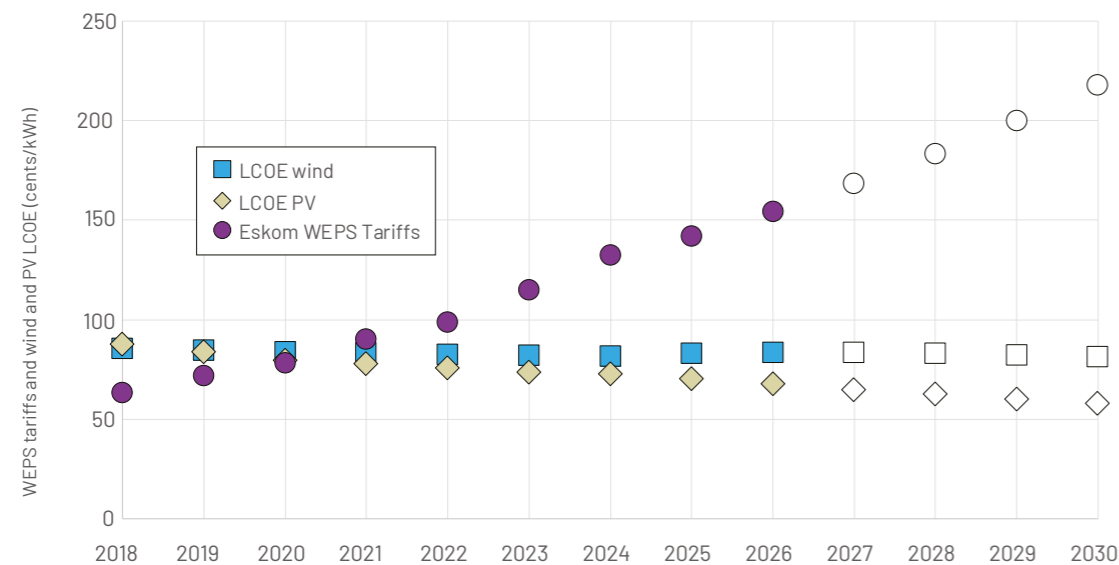


Figure 3: Eskom Tariffs Versus Wind and Solar PV Costs

Source data: Eskom, Meridian Economics, own calculations

36 Khonjelwayo, B. and T. Nthakheni (2021) 'Determining the Causes of Electricity Losses and the Role of Management in Curbing Them: A case study of City of Tshwane Metropolitan Municipality, South Africa. *Journal of Energy in Southern Africa*, 32(4), 45-57.

Figure 3 indicates that Eskom's WEP tariff was roughly equivalent to wind and solar PV tariffs in 2020, but since then the gap between Eskom and renewables tariffs (particularly between Eskom and solar PV) has widened considerably. In 2023, electricity produced by solar PV was 35 per cent cheaper than that produced by Eskom. In 2024, the difference was 43 per cent and in 2026, that difference was more than 50 per cent. It is estimated that **by 2030, the cost of electricity supplied by solar PV will be less than one third of the cost of that supplied by Eskom.** The cost comparisons for wind-generated power are almost as good.

The implication for bulk electricity costs of this difference is significant: If in the 2024/25 financial year just 15 per cent of municipal bulk costs came from renewables and the remaining 85 per cent came from Eskom, municipalities in aggregate could have saved around R10bn per annum. These savings could have contributed to improved financial viability of electricity distribution, helped to reduce debt owed to Eskom and significantly increased the amount of funding available for capital expenditure (which was R7.3bn in that year, across all municipalities).

In addition, if municipalities include battery storage as part of their renewables diversification,³⁷ they can provide a part of their peak demand from that battery storage. The result will be significant **additional** savings on bulk costs because they will no longer be paying the full peak demand rate charged by Eskom for that portion of supply.

Figure 4 below maps the average peak tariffs that Eskom charges municipalities against the cost of one example of potential battery storage (BESS).

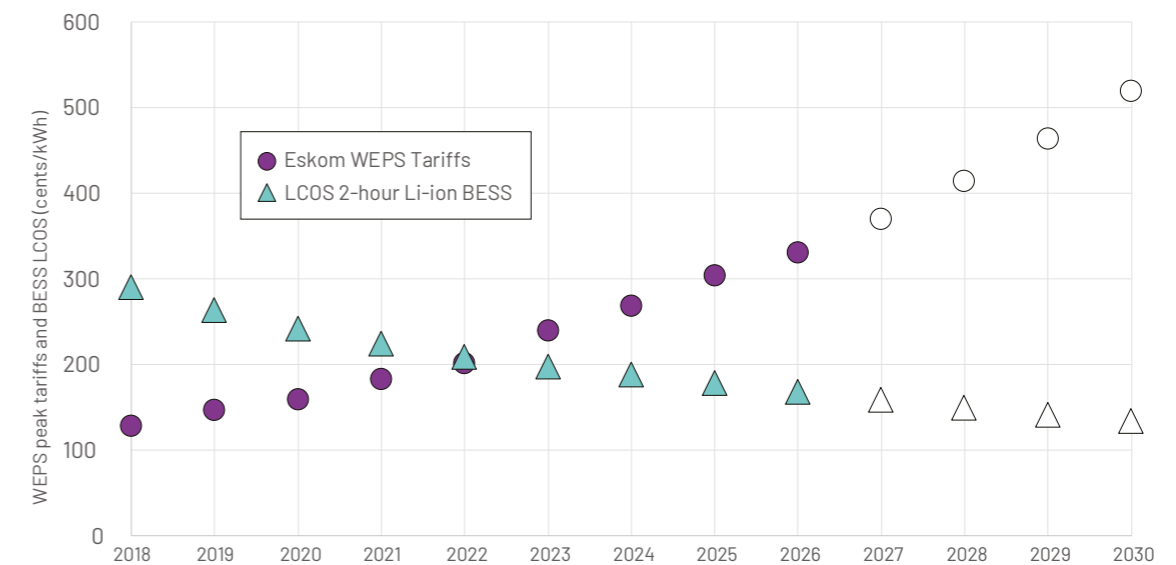


Figure 4: Eskom Tariffs Versus the Cost of Battery Storage

Source data: Eskom, Meridian Economics, own calculations

Figure 4 shows clearly how battery storage costs have declined since 2018, while Eskom's peak tariffs have risen sharply. We estimate that, by 2030, the gap between the Eskom average peak demand tariff and the BESS rate will be R3.91/kWh, while the gap between the high demand peak tariff and the BESS rate will be R7.62/kWh, as Eskom's tariffs continue to increase and the cost of BESS declines.

37 Either through an own investment, or as part of a package deal with an independent power producer.

There are thus significant potential benefits for municipalities to diversify bulk supply away from Eskom towards a combination of renewables, supported by battery storage.³⁸ The resulting decline in bulk supply costs, even for relatively small amounts of renewables and BESS, will make an important contribution to increased financial viability of municipal electricity distribution. This will immediately support increased funding of infrastructure maintenance and renewal, and will create long-term potential to moderate tariff increases – by decoupling them, in part, from Eskom’s rapidly rising tariffs.

2.4. Municipalities face considerable challenges in transitioning to renewables and current policies do not provide sufficient support

NOTE: Under current legislation municipalities have the option of either purchasing supply (including battery storage capacity) from third party (independent) service providers or investing in such assets directly (i.e. the municipality owns the renewable generation and/or battery storage). Our position is that, in most cases, the former approach (purchasing power and/or BESS capacity from a third-party supplier) is the better one, for the following reasons:

- In general, municipalities do not have the technical skills to effectively manage such infrastructure on a least-cost basis;
- The steady downward trend in the cost of renewables means that contracting purchases creates the opportunity for long-term decline in bulk costs, rather than being tied to municipal infrastructure. Much the same argument applies to rapidly evolving battery storage technology – there is no good reason for municipalities to be shackled to existing technology and costs for the foreseeable future.
- Most municipalities do not have the ability to raise the funding necessary to invest in the necessary generation and storage capacity.

In summary, purchasing supply and battery storage is much more likely to result in the desired long-term decline in bulk costs, while reducing technological risk and finance requirements.

Although the benefits are clear, most municipalities have struggled to make progress in diversifying bulk purchases away from Eskom to cheaper sources: with a few notable exceptions, most municipalities have few to no renewables or BESS as part of their bulk supply strategy. **Addressing the challenges that municipalities face in getting more renewable power onto their grids is the key to reducing the cost of bulk supply and delivering the resulting socioeconomic benefits.**

The main issues that municipalities must overcome in diversifying electricity purchases away from Eskom (and taking advantage of battery storage) are related to the requirement of designing and managing complex long-term supply agreements with third parties:³⁹

- Most suppliers want the certainty of multi-year sales agreements and receiving payment over the duration of these agreements. The current poor state of municipal finances is at odds with this goal. As Figure 2 indicates, aggregate municipal electricity generation operates at a loss, and many municipalities have a poor track record of paying Eskom and other suppliers timeously. In addition, more than 70 per cent of South African municipalities meet National Treasury’s definition of ‘financial distress’. Independent power suppliers are understandably reluctant to enter into long-term purchase agreements with financially insecure entities, particularly since the national government’s position has consistently been that it will not provide any kind of payment guarantee for these contracts.

³⁸ That is, battery storage charged by renewables.

³⁹ Although South Africa is moving towards a wholesale electricity market, there are enormous challenges to be overcome before municipalities will be able to participate in these markets at scale. Therefore, the assumption is that non-Eskom purchases will realistically be made via contracts with suppliers for the foreseeable future.

- Lack of technical and financial skills⁴⁰ required to design renewable energy supply requests for proposals, to evaluate submissions and to draft and manage associated long-term contracts. Many municipalities also lack the complex skills required to establish and manage the complex public-private partnerships (PPPs) often necessary to deliver long-term supply contracts under existing public procurement legislation.
- A lack of technical skills required to manage new diversified and intermittent supply, especially when it is being added to an existing aging and unstable distribution infrastructure network. Most municipalities have little or none of the engineering skills required to manage electricity grids with high levels of renewables penetration⁴¹ combined with battery storage.

An additional challenge to significant municipal purchases of renewables is the very slow pace of transmission grid expansion. This means that, in many cases, municipal distributors will require direct suppliers (i.e. who can feed power directly into a municipal system and largely bypass the transmission grid, although the extent of ‘bypass’ will differ by municipal location with respect to existing transmission infrastructure).

Municipal purchases of power generated by existing behind-the-meter solar installations (solar panels, inverters and battery storage) that has already been funded by residents could provide a relatively quick and easy initial part of a solution, particularly in metro areas, and would bypass or reduce many of these challenges. In addition, electricity from this source would create extra savings for municipalities because localised generation is associated with lower technical losses.⁴² In the case of the City of Johannesburg, average technical losses for power delivered from an Eskom intake point to the municipal customer is 9 per cent. The City estimates that, where embedded generation is dispersed and directly connected to the distribution network, losses will be reduced to 3 per cent.⁴³

But many municipalities have failed to take sufficient note of this opportunity, and in some cases are actively working to erase that opportunity by taking a punitive approach towards SSEG⁴⁴ installations. This approach is based on the erroneous assumption that the only impact of this infrastructure for the municipality is negative. Paradoxically, many municipalities are publicly declaring a desire to diversify electricity supply while actively working to extinguish the cheapest (and already built at someone else’s expense) source of that supply which is literally in their backyard.

In the next chapter, we closely examine the scale of this opportunity for municipalities, with a detailed focus on the City of Johannesburg – which has the country’s largest volume of municipal rooftop solar.

Addressing the challenges that municipalities face in getting more renewable power onto their grids is the key to reducing the cost of bulk supply and delivering the resulting socioeconomic benefits.

⁴⁰ Oladejo, O.M., E. Shava and N.C. Ndebele (2025) ‘Renewable Energy Adoption: A case of skill gaps in South African local government’. *Frontiers in Sustainable Energy Policy* 4: 1525160.

⁴¹ Ibid

⁴² Genesis (2017) ‘Final Impact Analysis of SSEG: Training session on solar PV impact analysis’. Training Resource: https://www.sseg.org.za/wp-content/uploads/2018/12/resource_438.pdf

⁴³ City Power (2020) ‘2nd Draft City Power Johannesburg (Soc) Ltd Business Plan (July 2020–June 2021)’. Johannesburg: City Power.

⁴⁴ Small-scale embedded generation such as rooftop solar PV and battery systems.



EXISTING BEHIND-THE-METER ROOFTOP SOLAR INSTALLATIONS: AN OPPORTUNITY FOR MUNICIPALITIES TO DIVERSIFY SUPPLY AND REDUCE COSTS

3.1 The scale of existing rooftop solar across South Africa

The uptake of rooftop (and ground-mounted) solar PV within municipal boundaries, connected to municipal (or Eskom) distribution networks has increased rapidly over the past five or so years. Initially, much of this was due to mitigation against load shedding, particularly from 2021 to 2024. With the elimination of load shedding, the continued increase is primarily due to economics – rooftop solar and battery energy storage systems (BESS) are increasingly cost competitive compared to almost all the municipal retail tariff structures.

This research report is based on estimates of the quantity of PV connected to distribution grids across South Africa drawn from a survey conducted by GeoTerra Image (GTI) which made use of satellite and other aerial photographic data. The process of identifying and recording the square-meterage of PV panels was automated and calibrated by ground-truthing a subset of the data to produce estimates per land-use category. Based on the GTI dataset, in December 2024 there was an estimated 3,495 MWp⁴⁵ of installed rooftop solar in South Africa. This is significantly lower than Eskom-published data of ‘rooftop’ solar PV in South Africa, but this is because Eskom⁴⁶ includes utility-scale solar that sells directly to commercial customers or wheels power through the grid. The aim of this study is to focus on rooftop solar that could be available as supply to municipalities and for these purposes, the GTI data is considered the more appropriate to use.

Figure 5 below summarises the data on a provincial level per land-use category (residential, commercial, industrial and other). Particularly notable is the very high level of residential rooftop installations in Gauteng – more or less equivalent to commercial and industrial installations combined. The reason for this is likely a combination of excellent solar irradiation, especially in the Winter months, coupled with a high number of households with the economic means to install PV systems and frequent power-supply failures across Gauteng municipalities.

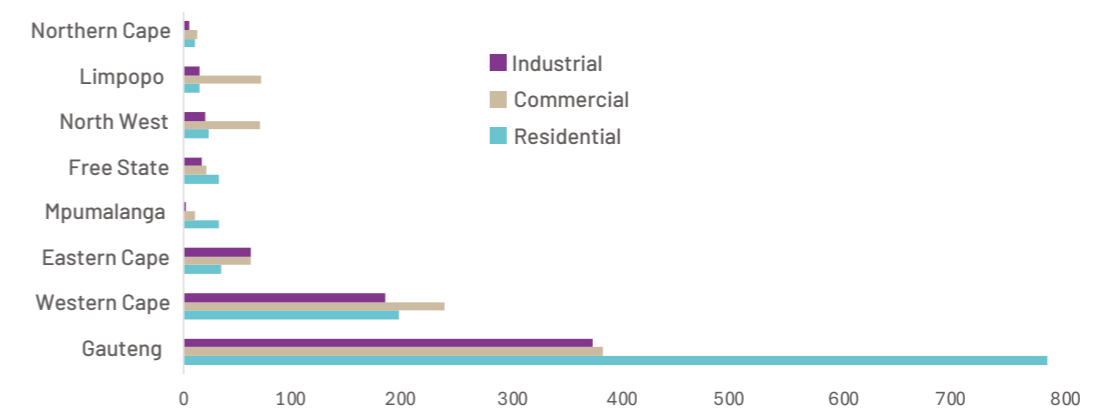


Figure 5: Behind-the-meter solar PV installations per province

Source: GTI data, own calculations

⁴⁵ MWp refers to the maximum output of a solar PV system under ideal conditions. It is not a measure of actual solar PV output, but rather the maximum that could be achieved.

⁴⁶ Eskom also makes these estimates using a totally different approach to that of GTI. They measure demand on a region-by-region basis at their large regional feeder substations. They make comparative estimates at midday on overcast and sunny days and use the difference as a proxy measure of the quantity of solar PV in the demand region fed by the specific substation. The difference between the Eskom and the GTI data tallies well with estimates made by the South African photovoltaic industry association (SAPVIA) for cumulative commercial utility-scale PV installations by December 2024.

Generation

Based on the GTI data set, we estimate⁴⁷ that approximately 5.98 billion kWh of electricity was generated from the total installed rooftop capacity of 3,495MWp over a one-year period. That estimate includes all of the GTI classes. If we limit the generation estimate to residential, commercial and industrial categories only, the estimated annual output is some 5.01 billion kWh. This represents approximately 2.2 per cent of total national annual demand.

It is instructive to compare this to the situation in Australia, who have similar solar resources to South Africa. In mid 2025, approximately 12 per cent of annual electricity came from rooftop solar installations, with around one in three homes having installed solar.

Figure 6 below shows the national position with respect to installed rooftop PV capacity compared to average municipal demand (as a percentage of that demand). It indicates that there are a relatively small number of municipalities (concentrated in the Western Cape and Gauteng) where this percentage is high, but most of these locations coincide with municipalities that have a high share of municipal electricity sales. That is, there is a strong correlation between how much electricity a municipality sells and the quantum of installed rooftop solar PV.

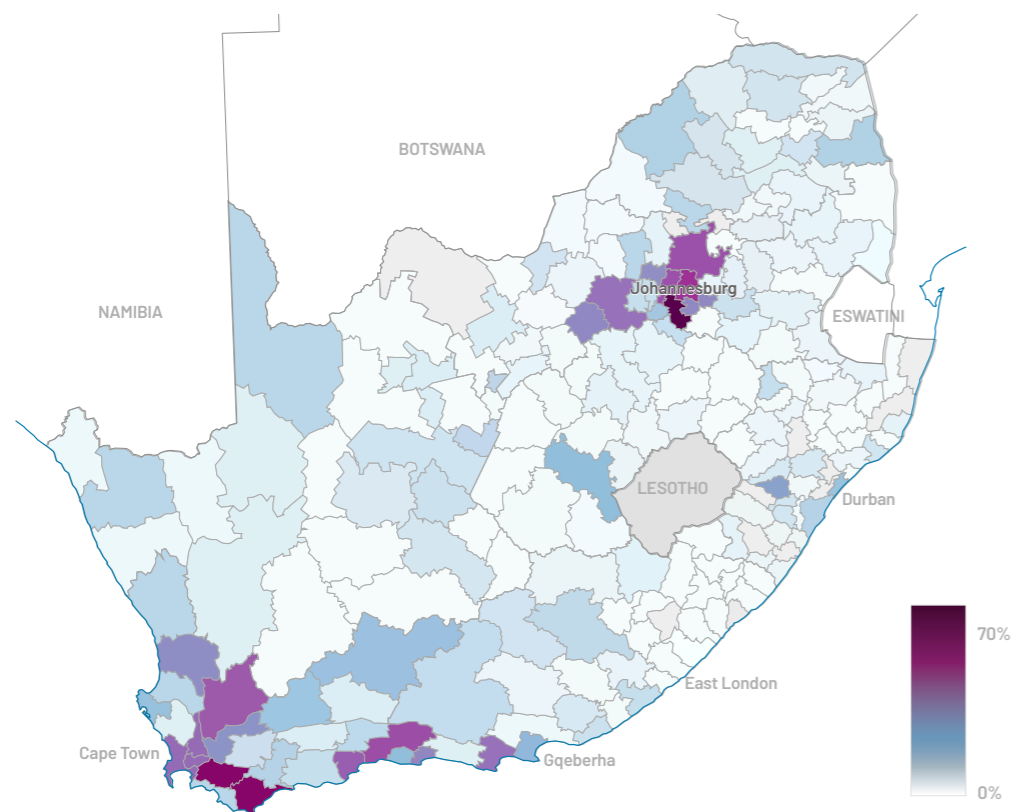


Figure 6: Installed PV Capacity as % of Average Municipal Demand

Source: Map data ©OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri.

⁴⁷ Output estimates were based on installed PV per local municipality adjusted for local solar irradiation quality as measured by global horizontal irradiation (GHI).

Table 1 below shows the top ten municipalities in terms of installed rooftop PV as at December 2024. These ten municipalities accounted for 78 per cent of the national total and the three largest Gauteng metros – Johannesburg, Ekurhuleni and Tshwane – accounted for 65 per cent of that top ten PV generation (that is, these three municipalities accounted for slightly more than half of the national total of installed rooftop solar PV).

TABLE 1: TOP TEN MUNICIPALITIES - INSTALLED ROOFTOP SOLAR PV AND GENERATION		
Municipality	PV Installed (MWp)	PV Generation (MWh/a)
Johannesburg (JHB)	586	1,025,986
Ekurhuleni (EKU)	451	793,706
Cape Town (CT)	429	714,988
Tshwane (TSH)	390	685,504
eThekweni (ETH)	159	220,329
Nelson Mandela Bay (NMB)	86	125,673
Mangaung (MANG)	50	90,333
Emfuleni (EMF)	39	68,450
Matlosana (MAT)	38	68,229
Mogale City (MOG)	34	59,616
TOTAL	2,262	3,852,814

Curtailment

The main purpose of rooftop solar is generally to provide electricity for the household or business enterprise (rather than making it available to feed into the municipal grid). However, systems automatically stop producing power when all usage has been covered and batteries are fully charged. In peak solar irradiation times – such as the middle of the day – the system could produce more power, but there is no place for this power to go. This automatic reduction of generation is referred to as *curtailment*, and this curtailed power is what is potentially available for feed-in into the municipal grid (as opposed to all of the power produced by the system). Most of the excess is produced in the non-Winter months (September to April), when solar output is higher and household demand is generally lower.

We have estimated the level of curtailment across rooftop solar installations based on discussions with a number of rooftop solar installers (for example, oneSolar), as well as with individuals who have solar + BESS at their homes, from high-usage residential to low- to medium-usage residential customers. Based on these discussions, we estimate that approximately 30 per cent of potential rooftop solar output is curtailed. In most cases this excess is curtailed at the inverter. Based on this 30 per cent curtailment estimate, **approximately 1.1 billion kWh of rooftop solar is curtailed annually** (based on the estimated December 2024 installation base).

As expected, the highest curtailment levels occur in the municipalities with the highest levels of installed PV: Table 2 below indicates that Johannesburg, Ekurhuleni and Tshwane currently have estimated combined curtailment of almost 758,000MWh per annum – or around half of the national curtailment.

Approximately 1.1 billion kWh of rooftop solar is curtailed annually.

TABLE 2: TOP TEN MUNICIPALITIES BY INSTALLED ROOFTOP PV – CURTAILED ROOFTOP SOLAR PV PRODUCTION COMPARED TO TOTAL ANNUAL ESTIMATED MUNICIPAL ELECTRICITY CONSUMPTION			
Municipality	Total estimated electricity consumption (MWh/a)	Estimated Curtailment (MWh/a)	Curtailment % of consumption
Johannesburg (JHB)	10,836,120	307,796	2.8%
Ekurhuleni (EKU)	7,402,200	238,112	3.2%
Cape Town (CT)	8,768,760	214,496	2.4%
Tshwane (TSH)	7,174,440	205,651	2.9%
eThekweni (ETH)	8,111,760	66,099	0.8%
Nelson Mandela Bay (NMB)	2,768,160	37,702	1.4%
Mangaung (MANG)	1,725,720	27,100	1.6%
Emfuleni (EMF)	1,603,080	20,535	1.3%
Matlosana (MAT)	911,040	20,469	2.3%
Mogale City (MOG)	840,960	17,885	2.2%
TOTAL	50,115,240	1,155,844	2.3%

In theory, this curtailed power is available for purchase by municipalities, both to increase available supply and to reduce overall municipal bulk costs, since feed-in tariffs to purchase that excess are generally significantly lower than the tariffs that Eskom charges municipalities.

Fifty-two municipalities currently have policies in place that offer customers the option to feed their surplus (curtailed) electricity back into the distribution grid, where it is purchased by the local municipality, generally in the form of a credit issued to the customer that can be offset against electricity services charges. These municipalities are illustrated in Figure 7 below.

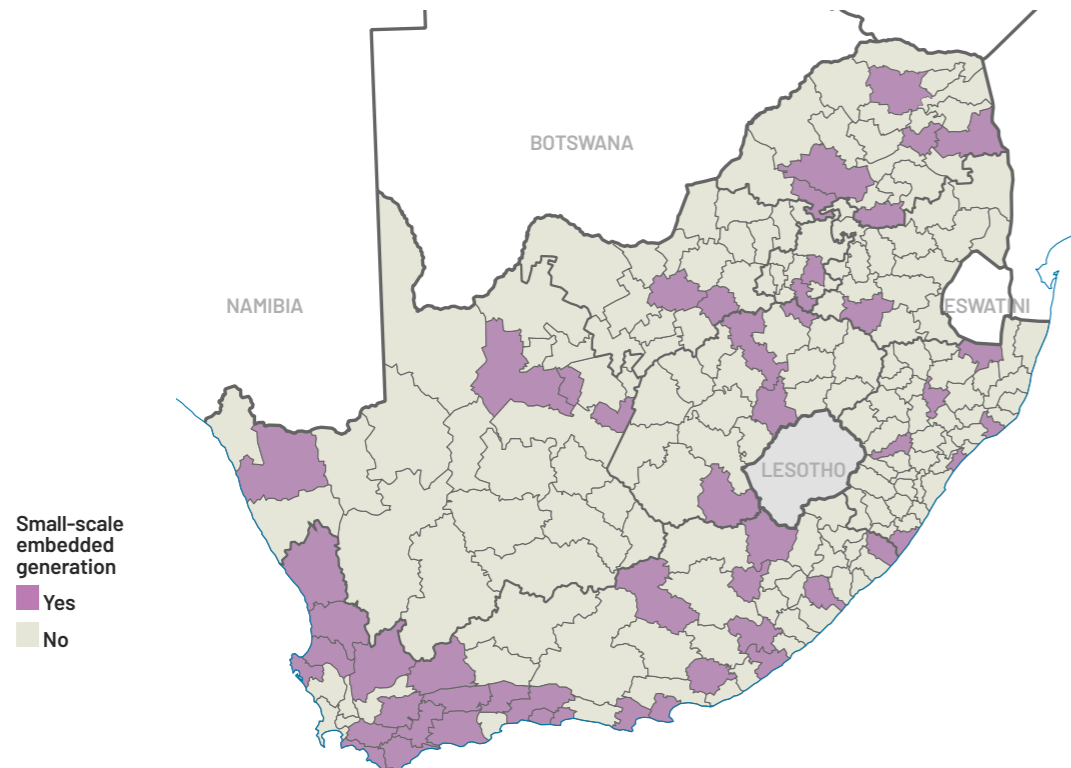


Figure 7: Municipalities with electricity feed-in policies applicable to customers
 Source: NERSA and AGSA

It should be noted, however, that having a policy does not mean that it is actually operational. As just one example, the City of Johannesburg has had such a policy in place since 2023,⁴⁸ but to date, there is no evidence that power is being purchased at scale from solar PV owners. Reasons for the failure to implement vary, but are often linked to onerous and expensive conditions that municipalities wish to impose on potential sellers, which act as an effective deterrent. As examples, customers are often required to pay for the required bi-directional meters themselves, are forced to pay fees associated with system registration, and many municipalities are limiting the ability of registered solar system owners to be on prepaid billing systems (which are significantly cheaper for low-use customers than postpaid billing). For many residential system owners, these additional costs outweigh the financial benefits of selling electricity to the municipality and disincentivise system registration.

3.2. There are potentially significant benefits for municipalities from these existing installations, especially if combined with BESS

If municipalities were able to purchase the excess power that is currently curtailed, they would generate a financial benefit, given that feed-in tariffs are considerably lower than the tariffs charged by Eskom. Over the next five years, the gap between the two tariffs is expected to increase further, thus increasing the financial benefit.

For the purposes of this research we have used an estimated feed-in tariff for rooftop solar of R1.00/kWh. A review of recent municipal tenders for the purchase of electricity from independent power producers (IPPs) connected directly to the municipal grid indicates that R1.00/kWh is within the range of bid tariffs for mid-sized ground-mounted PV installations and therefore represents a fair and comparable offer.⁴⁹ In the City of Cape Town for example, the current rate for the feed-in tariff is R1.01/kWh, with an additional R0.25/kWh SSEG feed-in incentive.

For municipalities that are on Eskom Megaflex tariffs, which represents the bulk of the municipalities, the offset value for a solar PV time-of-use output profile (i.e. matching to the fact that solar output and thus curtailment, is highest in the middle of the day) is approximately R1.92/kWh. Using the proposed feed-in tariff of R1.00/kWh and this estimated Eskom offset tariff of R1.92/kWh, the resulting savings to the municipalities are around R0.92/kWh for every kWh of Eskom supply that is replaced by rooftop solar generation. In addition, because the cost of Eskom bulk power is expected to increase above inflation (Figures 3 and 4) for the foreseeable future, this saving is most likely to increase significantly over the next five to ten years.

⁴⁸ Moneyweb, 'Johannesburg wants to buy households' excess solar power', R. van Niekerk, 5 July 2023.
⁴⁹ The feed-in tariff amount could increase to R1.50/kWh if customers feed power back into the grid at Eskom peak tariff times (morning and evening, utilising both excess generation and batteries) and the municipality would make an even greater margin given how high the Eskom peak tariffs are – currently above R3/kWh. This would increase municipal savings to at least R1.50/kWh

Figure 8 below indicates the estimated savings on bulk costs per province that could have materialised in 2025 if all excess curtailed power from current SSEG installations had been purchased, together with estimates of how those savings could have increased in 2030 and 2035.

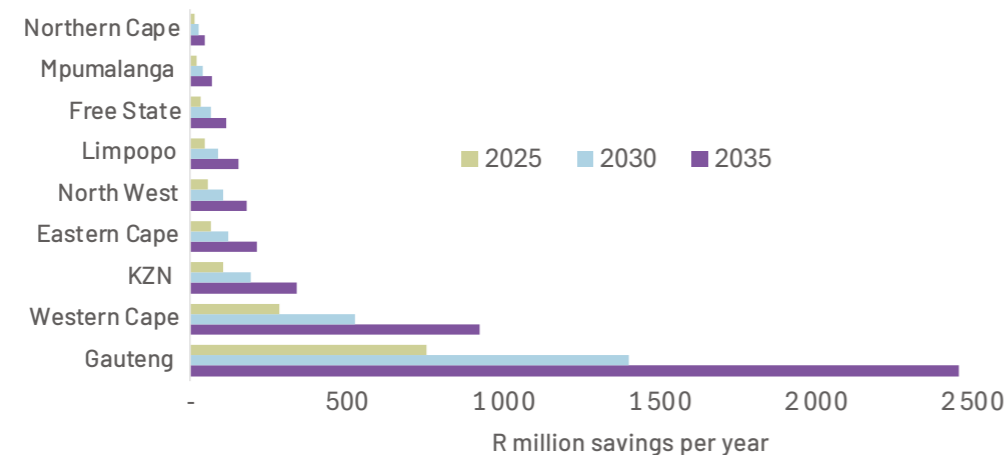


Figure 8: Potential savings on bulk costs per province from the purchase of curtailed power from existing SSEG installations (R millions)

Figure 8 clearly illustrates the significant (and exponential) benefits that could accrue to Gauteng province given its relative share of national installed rooftop solar PV.

Table 3 below indicates the estimated savings on bulk costs that the top ten municipalities could have earned in 2025 if they had purchased all of the curtailed excess power from existing rooftop installations (i.e. as at December 2024) and how much they could potentially save in 2030 and 2035 as Eskom costs increase (at that same level of rooftop installation).

TABLE 3: POTENTIAL ANNUAL SAVINGS ON BULK COSTS FROM EXISTING ROOFTOP SOLAR PV INSTALLATIONS

Municipality	2025 (R millions)	2030 (R millions)	2035 (R millions)
Johannesburg (JHB)	285	529	927
Ekurhuleni (EKU)	219	407	713
Cape Town (CT)	198	367	644
Tshwane (TSH)	193	358	628
eThekweni (ETH)	62	115	202
Nelson Mandela Bay (NMB)	35	66	115
Mangaung (MANG)	25	47	82
Emfuleni (EMF)	20	36	63
Matlosana (MAT)	19	36	63
Mogale City (MOG)	17	31	55
TOTAL	1,073	1,993	3,492

These potential savings across all of local government (R3.5bn) may appear relatively small when compared to bulk purchases: The 2024/25 bulk purchases of the largest Gauteng municipalities were:

- Johannesburg: R19bn;
- Ekurhuleni: R18bn; and
- Tshwane: R15.5bn

However, the potential savings are more significant when compared to the capital expenditure⁵⁰ of each municipality for that year:

- Johannesburg – R1.6bn (savings = R285 million),
- Ekurhuleni – R348 million (savings = R219 million), and
- Tshwane – R596 million (savings = R193 million).

That is, these savings could have made an important contribution to increasing capital expenditure budgets and thus, to reducing outages and improving reliability of supply. Further, the estimates set out above do not include the additional savings that municipalities would earn because of reduced technical losses (because of localised supply).

These potential savings could be significantly increased by utilising BESS, leased from IPPs.

Large-scale BESS (defined for our purposes as >1MW/2MWh) could be deployed by municipalities to further increase cost savings and to manage energy distribution more effectively. The cost of BESS has been reduced to the point where it has become economically viable to use in the network. Deployment of BESS at strategic points in the distribution networks with intelligent energy management software (EMS) adds numerous benefits, namely arbitrage savings, peak demand management and power factor correction. **Municipalities that purchase bulk power from Eskom at Megaflex tariffs can expect to save >R1 million per annum per 1MW/2MWh of BESS installed on their networks.**

This saving assumes that the BESS is

- i. charged from excess rooftop solar during the daytime and discharged during the evening peak;
- ii. then charged again at night at Eskom off-peak tariffs and discharged during the morning peak.

This tariff arbitrage would only happen on weekdays when peak time-of-use tariffs occur in the mornings (two hours) and evenings (three hours). It also assumes that the BESS is funded privately (i.e. that there is no capital expense for the municipality but that they pay a fee per kWh. The municipality would lease the BESS from an IPP, thereby reducing upfront capital requirements and technical skills to be provided by the municipality.) The projected savings are the difference between the net arbitrage earnings accruing to the municipality, minus the lease charge, which would include all operation and maintenance costs that would be undertaken by the IPP.

A clear distinction needs to be drawn between supplying the least-cost electricity to a municipality, as is the case with solar PV only, or providing the municipality with the greatest saving relative to wholesale purchases from Eskom. The policy goal should be to maximise the latter, rather than to minimise the former. A PV + BESS case offers significantly more savings than the PV only case, even when accounting for the tariff that must be paid to lease the BESS.

Table 4 below indicates the potential savings for the top ten municipalities (by installed rooftop solar) of adding BESS to absorb daytime excess solar and discharging this during the evening peak. Additionally, the calculations include charging the batteries again overnight (at the lowest Eskom rate) and discharging them during the early morning peak. The savings for municipalities are significantly enhanced by avoiding a portion of the Eskom peak time-of-use tariffs and this more than offsets the additional cost that must be paid for that BESS.

Municipalities that purchase bulk power from Eskom at Megaflex tariffs can expect to save >R1 million per annum per 1MW/2MWh of BESS installed on their networks.

⁵⁰ Bulk purchases and capital expenditure data drawn from MFMA Section 71 reports.



3.3. The real opportunity for municipalities is to encourage expansion of existing installations (coupled with additional BESS)

Although the financial benefits to municipalities of purchasing curtailed power from existing rooftop solar PV installations is notable – particularly if combined with BESS – **the real financial opportunity for municipalities is to encourage existing solar installation owners – particularly residential owners – to increase the size of those installations.** Many solar PV owners (particularly in the residential segment) could increase the number of panels in their installation relatively quickly and easily, since all the supporting infrastructure is already in place. This additional infrastructure would significantly increase the amount of excess power potentially available to the municipality (since the installation owner would probably use very little of it for additional own consumption).

This additional supply would further benefit the municipality if accompanied by purchasing additional matching BESS storage: as discussed above, the combination of PV and BESS results in a significant increase in savings, even though the costs of this solution are higher than PV alone.

Encouraging existing rooftop solar owners to increase the size of their installations *and* to lease additional BESS capacity could therefore result in significant financial benefits to municipalities in a relatively short space of time.

Table 5 below summarises the financial impact in two scenarios: both model the impact of a 20 per cent increase in commercial and industrial rooftop solar PV, while the first scenario models a 30 per cent increase in residential rooftop solar and the second, a 50 per cent increase in residential rooftop solar. The assumption was made that there is a high likelihood that many more commercial and industrial sites will have already installed the maximum amount of solar panels compared to residential sites given their comparatively higher level of electricity consumption and greater negative impacts of load shedding. (Note that these calculations are based on upsizing existing installations – as at December 2024 – and do not include any additional installations that might be made in response to greater incentives.)

TABLE 4: ESTIMATED SAVINGS FROM EXISTING ROOFTOP SOLAR PV INSTALLATIONS COMBINED WITH BESS

	Average demand	Consumption per annum	C&I rooftop PV	Residential rooftop PV	Total C&I and residential rooftop PV	Current PV annual output	Current PV excess output	BESS installed	Current excess PV & BESS output	Value of excess		
	MWac	MWh/a	MWp	MWp	MWp	MWh/a	MWh/a	MW	MWh	MWh/a	R/kWh	Rm/a
JHB	1,237	10,836,120	281	305	586	1,025,986	307,796	250	500	397,018	1.34	532
EKU	845	7,402,200	262	188	451	793,706	238,112	193	387	305,410	1.34	409
CT	1,001	8,768,760	272	157	429	714,988	214,496	174	348	277,095	1.35	374
TSH	819	7,174,440	162	228	390	685,504	205,651	167	334	265,252	1.34	355
ETH	926	8,111,760	136	24	159	220,329	66,099	54	107	85,786	1.20	103
NMB	316	2,768,160	64	22	86	125,673	37,702	31	61	48,765	1.20	59
MANG	197	1,725,720	35	15	50	90,333	27,100	22	44	34,952	1.36	48
EMF	183	1,603,080	19	20	39	68,450	20,535	17	33	26,602	1.35	36
MAT	104	911,040	35	3	38	68,229	20,469	17	33	26,536	1.37	36
MOG	96	840,960	12	22	34	59,616	17,885	15	29	23,238	1.36	32

The total value of the excess (curtailed) power can be almost doubled by the addition of BESS as described, even after taking into account the additional cost of leasing that BESS. The combined savings across municipalities now amounts to R1.98bn (compared to R1.1bn for solar alone).

TABLE 5: ESTIMATED SAVINGS FROM INCREASING THE SIZE OF EXISTING ROOFTOP SOLAR PV INSTALLATIONS COMBINED WITH BESS

	20% increase in C&I	30% Increase in residential rooftop PV	Total C&I and residential rooftop	Increased PV annual output	PV excess C&I	PV excess residential	Total PV excess	BESS installed	Increased excess PV and BESS output	Value of excess				
	MWp	MWp	MWp	MWh/a	%	MWh	%	MWh	MWh/a	MW	MWh	MWh	R/kWh	Rm/a
JHB	337	396	733	1,283,786	30	176,979	46	319,174	496,153	403	806	640,274	1.34	858
EKH	315	245	559	984,612	30	166,239	46	198,022	364,261	231	461	462,35	1.32	610
CT	326	204	530	883,318	30	162,871	46	156,59	319,462	201	402	391,362	1.25	489
TSH	194	297	491	863,012	30	102,417	46	239,947	342,363	216	431	419,453	1.28	537
ETH	163	31	194	268,418	30	67,72	46	19,635	87,355	55	109	106,572	1.13	120
NMB	77	28	105	153,825	30	33,695	46	19,094	52,789	33	66	64,56	1.16	75
MANG	42	19	61	110,207	30	22,752	46	15,809	38,561	24	49	47,3	1.29	61
EMF	23	26	49	86,001	30	12,151	46	20,929	33,08	21	41	40,842	1.28	52
MAT	42	4	46	82,593	30	22,477	46	3,528	26,005	16	33	31,871	1.28	41
MOG	14	29	43	76,098	30	7,517	46	23,479	30,996	19	39	37,781	1.27	48

The total value to the top ten municipalities of Scenario 1 in the first year is R2.9bn, and of Scenario 2 is R3.6 bn. **The quantum of this will increase each year, as the cost gap between Eskom and the solar PV BESS gap widens.**

In the next chapter we have investigated all of these issues in more detail for one specific municipality – the City of Johannesburg.



CHAPTER FOUR

**ILLUSTRATIVE CASE STUDY:
CITY OF JOHANNESBURG (CITY POWER)**

4.1. City Power overview

Electricity distribution services for the City of Johannesburg (CoJ) are provided by both Eskom and City Power. In terms of energy delivered, roughly 60 per cent is delivered through City Power networks and 40 per cent through Eskom networks. The estimated CoJ load profile is shown for each month of the year as average hourly loads in Figure 9 below.

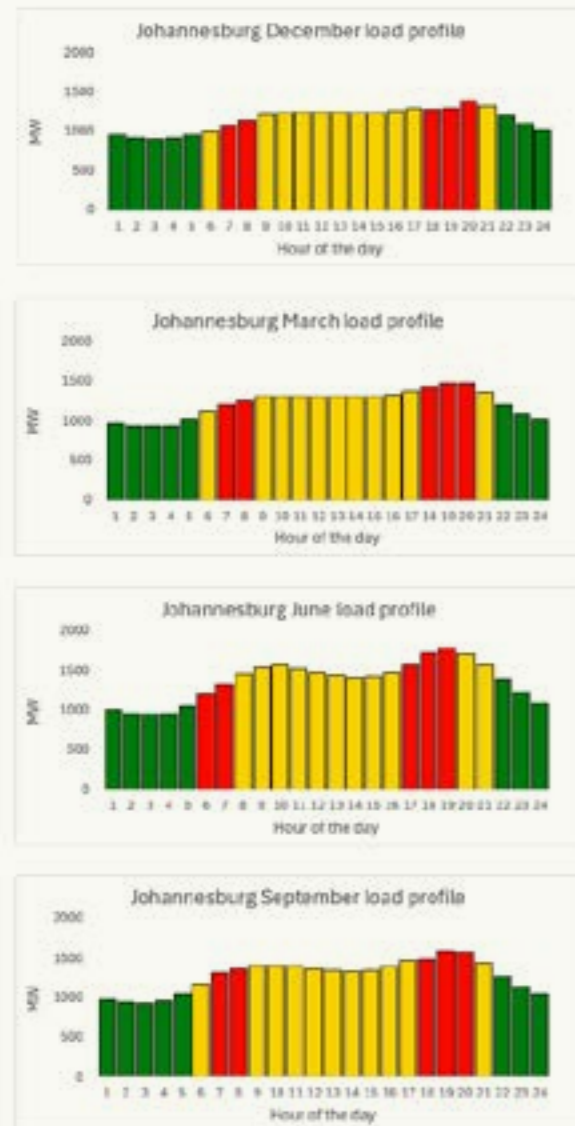
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave.
0	905	994	974	888	900	1,008	999	979	983	1,020	1,051	959	972
1	873	962	944	862	873	965	956	942	947	985	1,020	923	938
2	863	954	935	849	864	947	938	926	934	976	1,008	908	925
3	869	962	941	869	887	967	957	952	958	1,001	1,026	915	942
4	933	1,051	1,017	961	990	1,053	1,078	1,071	1,055	1,112	1,119	957	1,033
5	1,067	1,212	1,124	1,147	1,191	1,207	1,270	1,237	1,178	1,282	1,247	1,010	1,181
6	1,136	1,293	1,218	1,283	1,341	1,325	1,413	1,382	1,314	1,361	1,296	1,063	1,285
7	1,180	1,292	1,254	1,285	1,350	1,453	1,503	1,444	1,373	1,339	1,313	1,144	1,328
8	1,266	1,357	1,321	1,314	1,364	1,547	1,559	1,474	1,414	1,353	1,349	1,216	1,378
9	1,280	1,354	1,320	1,299	1,332	1,573	1,569	1,477	1,411	1,341	1,351	1,236	1,379
10	1,284	1,349	1,313	1,275	1,293	1,528	1,517	1,429	1,392	1,332	1,352	1,241	1,359
11	1,282	1,342	1,306	1,257	1,267	1,478	1,464	1,379	1,370	1,323	1,353	1,243	1,339
12	1,277	1,341	1,300	1,242	1,246	1,436	1,420	1,339	1,350	1,316	1,351	1,242	1,322
13	1,270	1,337	1,296	1,238	1,234	1,412	1,393	1,314	1,339	1,308	1,350	1,229	1,310
14	1,280	1,357	1,309	1,255	1,256	1,422	1,403	1,321	1,355	1,331	1,364	1,234	1,324
15	1,303	1,384	1,335	1,303	1,311	1,478	1,467	1,377	1,397	1,383	1,403	1,257	1,366
16	1,337	1,422	1,382	1,371	1,404	1,583	1,569	1,462	1,469	1,445	1,446	1,293	1,432
17	1,355	1,436	1,416	1,467	1,556	1,720	1,663	1,492	1,488	1,444	1,430	1,275	1,479
18	1,381	1,471	1,483	1,575	1,630	1,789	1,793	1,643	1,589	1,539	1,472	1,288	1,554
19	1,433	1,520	1,481	1,473	1,488	1,705	1,752	1,644	1,577	1,571	1,546	1,377	1,547
20	1,361	1,430	1,358	1,321	1,349	1,574	1,612	1,504	1,441	1,436	1,452	1,327	1,430
21	1,200	1,262	1,208	1,167	1,188	1,396	1,415	1,323	1,273	1,272	1,295	1,205	1,267
22	1,064	1,130	1,094	1,035	1,052	1,226	1,224	1,168	1,144	1,164	1,189	1,104	1,133
23	965	1,029	1,010	943	957	1,093	1,088	1,049	1,047	1,073	1,100	1,015	1,031

Figure 9. Estimated Johannesburg Average Hourly Load Values for Each Month of the Year (weekday peak tariff times outlined in boxes)

Source: NERSA, own calculations

The same data is portrayed as estimated average daily load for each hour for four selected months in Figure 10 below. Off-peak hours are green, standard hours yellow and peak hours red. (Note the shift in peak times in Winter (June) as compared to Summer, Autumn and Spring.) These are average loads for each hour for each month. They do not reflect the actual peak load, which was in fact higher, at approximately 1,973MW.

The peak time-of-use tariff periods are in red. These peak tariffs only pertain to weekdays, not weekends. Winter peaks are higher than Summer peaks (i.e. more electricity is used during this period).



CoJ has a load profile typical of a large city. It comprises industrial, commercial, residential and other (education, health, etc.) consumption, with fairly large differences between daytime and nighttime demand and the early morning and early evening peak periods. The highest consumption periods are in the peaks during the three winter months.

The average demand is 1,260MW. The maximum demand is ~1,973MW, with a minimum of ~635MW. The peak, standard and off-peak tariff period splits are also typical of a large city, namely: peak ~17%; standard ~41%; and off-peak ~42%

The graphics on the left show average hourly load profiles for the CoJ for December, March, June and September, with green representing off-peak time-of-use tariff periods, yellow standard tariffs and red peak tariffs for weekdays. Note the shift of the peak tariffs in June (Winter peak season) to one hour earlier.

Figure 10. Estimated average hourly monthly loads for four months at different time-of-use periods

Source: NERSA, own calculations

City Power is currently in severe financial distress: Published quarterly data⁵¹ for the last quarter of the 2024/25 financial year⁵² indicate the following:

- Revenue of R22.9bn (with a 94.1 per cent collection rate)
- Expenses of R27.4bn
- Net loss: R4.4bn
- Net overdraft: R15.6bn (68 per cent of total revenue)

The net deficit grew by 5 per cent over the previous financial year, even though revenue increased by 11.5 per cent over the same period. City Power currently owes Eskom some R5bn and has been unable to adhere to the terms of the most recent repayment agreement, resulting in threats by Eskom to cut bulk supply.⁵³ As discussed in the previous chapter, unplanned outages are increasing in Johannesburg, indicating a growing inability to maintain a reliable supply of electricity in the most important centre of economic activity in South Africa.

Part of the growing mismatch between revenue and expenses is explained by City Power's own reporting on electricity purchases (mostly from Eskom)⁵⁴ and sales (to residents). Table 6 below indicates this data for the 2022–25 financial years.

TABLE 6: CITY POWER PURCHASES AND SALES OF ELECTRICITY (MWH)				
	2025	2024	2023	2022
Purchased (MWh)	10,050,832	9,759,156	9,717,576	11,030,868
Sold (MWh)	6,680,597	6,843,658	6,835,177	7,780,265
Sold as % of purchased	66.5%	70.1%	70.3%	70.5%
Losses (MWh)	3,370,235	2,915,498	2,882,399	3,250,603
Change in sold (y/y %)	-2.3%	+0.1%	-12%	

Source: City Power annual and quarterly reports

Electricity losses (technical and non-technical) are currently around 34 per cent (almost 3.4bn kWh per annum) – well above the international average of 15 per cent. Every 1 billion kWh of losses costs City Power **at least** R2bn in lost sales. Losses have increased steadily over the past three years: City Power has purchased more and more electricity but sold less and less to its customers. In the most recent financial year, **the utility only sold two thirds of the electricity that it purchased.**

There was a significant drop in electricity sales from 2022 to 2023, which coincided with the steep increase in load shedding (the worst recorded month of load shedding was May 2023). Eskom's electricity generation declined by 7 per cent in FY 2023, compared to FY 2022⁵⁵ (which period excluded the worst months of load shedding).

However, the end of load shedding was not accompanied by a matching return to 2022 levels of electricity sales for City Power. This is probably due to several factors:

- Increased technical losses due to aging infrastructure – as indicated by the growing gap between purchases and sales.
- Increased non-technical losses due to illegal connections and electricity theft – which is also indicated by the sharp increase in the gap between purchases and sales.
- Lost sales due to the steady increase in unplanned outages – during which ever-increasing numbers of consumers cannot use electricity.
- Substitution of other less expensive and more reliable energy sources, notably gas for water heating, space heating and cooking.
- Increase in own electricity supply from rooftop solar PV installations – which saw the most rapid growth in 2023, in response to load shedding.

City Power has purchased more and more electricity but sold less and less to its customers. In the most recent financial year, the utility only sold two thirds of the electricity it purchased.

51 City Power Quarterly Reports: <https://www.citypower.co.za/about-us/company-reports/quarterly-reports>

52 The most recent available published City Power annual financial statements are for the 2022/23 financial year.

53 Sandton Chronicle, 'City of Joburg debt tops R52bn as Eskom threatens supply cuts to parts of Johannesburg', 20 May 2026.

54 City Power also purchases a relatively small amount of power from Kelvin Power Station.

55 Daily Energy and Power News, 'Eskom's power generation declined by 7% in FY 2022/23 (South Africa)', 2 November 2023.

4.2. Rooftop solar installations are not the main reason for declining City Power revenue

The most common reason offered for declining municipal electricity revenues is this last factor – the rapid growth in rooftop solar installations –⁵⁶

*As businesses and wealthier households increasingly turn to rooftop solar and private generation, municipalities are being left with shrinking revenue bases while carrying the fixed costs of maintaining ageing electricity networks.*⁵⁷

Given that Johannesburg is the municipality with the single largest amount of installed rooftop solar PV (concentrated in the residential segment), City Power has enthusiastically embraced this opinion, and as a result has adopted a number of policies intended to extract significantly higher fees from residential rooftop solar owners as ‘compensation’.

There is no empirical evidence that the decline in electricity sales by City Power is due entirely, or even mostly, to rooftop solar installations. As counter arguments we offer the following:

- The biggest category of electricity usage in households is water heating, with cooking and space heating (in Winter) other important demand components.⁵⁸ These are exactly the energy uses that are least likely to be fully replaced by home solar and BESS systems, given the high current that they require.
- Data suggest that consumers are increasingly replacing electric water heaters and stoves with gas appliances (rather than powering these with solar): the 2024 General Household Survey indicated that household ownership of gas stoves and plates increased from 19 per cent in 2022 to 30.4 per cent in 2024.⁵⁹ Gas geysers and heat pumps (which use substantially less electricity than traditional electric geysers) offer cheaper water heating solutions for exactly the relatively wealthy households who are more likely to have rooftop solar installations. The substitution effect of gas has almost certainly been responsible for at least part of the decline for demand in electricity.
- The rapidly increasing cost of electricity encourages both self-limiting consumption and illegal connections, both of which contribute to reduced electricity purchases.
- The estimated generation by rooftop installations in Johannesburg that is consumed (i.e. 70 per cent of installed capacity) is approximately 772,000 MWh/annum. At least a portion of that is most likely consumed during City Power’s numerous unplanned outages (100,000 reported over a nine-month period during 2025). That is, rooftop solar owners are almost certainly using a portion of that self-generated electricity while City Power was unable to supply them (and thus would not have been able to bill for usage). We cannot simply assume that this total amount of generation was simply deducted from sales that City Power could realistically have made.
- **Electricity losses (technical and non-technical) are almost five times higher than the most generous estimate of self-generation of electricity. This is the real reason why City Power is in serious financial trouble: If losses were 20 per cent (instead of 34 per cent), at an average Eskom tariff of R1.92/kWh (R1,920/MWh), bulk costs would have been some R3.3bn lower.**

⁵⁶ JET Group (2026) ‘The Impact of Solar Panels on South African Municipalities Revenue Streams’. Sanedi Conference 2026. Pretoria: University of Pretoria.

⁵⁷ *Mail&Guardian*, ‘SAs municipal power supply goes downhill’, H. Kathrada, 13 March 2026.

⁵⁸ Hughes, A. and R. Larmour (2021) ‘Residential Electricity Consumption in South Africa’. Research Project Report. Cape Town: University of Cape Town.

⁵⁹ StatsSA (2025) ‘General Household Survey (GHS), 2024’. Media Release 27 May 2025. Pretoria: Statistics South Africa.

Despite the fact that rooftop solar installations are most likely not the main reason for City Power’s widening operating losses and could be the basis for a significantly lower future cost base, the utility is determined to introduce a range of measures targeted at rooftop solar PV owners. These include:

- Forcing households with solar PV that are currently on prepaid systems to postpaid systems and time-of-use tariffs. This will result in significant increases in electricity tariffs for these households: postpaid fixed charges together with peak demand costs will mean a bill of approximately R1,561 per month for the average household **before** the consumption of any electricity units. In comparison, prepaid customers pay a fixed fee of R230 per month and no additional peak demand tariffs. **The increase in tariffs far outweighs what a household with an average-size solar installation could earn in feed-in tariffs (at a feed-in tariff of R1 per kWh, households would have to generate an excess of 50 kWhs per day on system just to cover the increased tariffs associated with a move to postpaid).**
- If households opt to feed electricity into the City Power system, they will also be required to cover the costs of the requisite bidirectional meters.

A combination of the proposed forced migration of households onto more expensive postpaid systems and likely significant increases in electricity tariffs over the next three to five years are quickly creating a situation where migrating off grid is becoming more and more viable. The grid defection benefits are particularly high for customers who have already part migrated to gas in addition to solar PV. We would expect a significant increase in grid defection rates if City Power forces residential rooftop owners onto the significantly more expensive postpaid time-of-use tariff system.

The current asset that City Power has is the fact that it has more rooftop solar than any other municipality and that this generation capacity is concentrated in the residential sector – which has the greatest potential to expand existing installations. Grid defection is the worst possible outcome for City Power because they will lose more sales and – most importantly – any possibility of leveraging existing rooftop solar infrastructure to reduce bulk costs.

City Power’s current approach to regulating rooftop solar PV is effectively shutting the door on the financial benefits summarised in Tables 4 and 5.

In contrast, the best outcome for City Power is to encourage customers with rooftop solar installations not just to remain on the grid, but to increase the size of their installations and to sell the excess back to City Power.

Table 7 below summarises the potential financial benefits to City Power of the three scenarios –

- a. existing installations,
- b. a 20 per cent increase in commercial and industrial installations and a 30 per cent increase in residential installations, and
- c. a 20 per cent increase in commercial and industrial installations and a 50 per cent increase in residential installations.

All scenarios include matching leased BESS. That is, there are very few capex or maintenance costs for the City, but substantial financial benefits. Over the next 10 years these benefits would increase exponentially, as Eskom tariffs continue to increase well above inflation.

City Power has more rooftop solar than any other municipality. This generation capacity is concentrated in the residential sector, which has the greatest potential to expand existing installations.

TABLE 7: ESTIMATED SAVINGS FROM EXISTING AND INCREASED SIZE OF EXISTING ROOFTOP SOLAR PV INSTALLATIONS COMBINED WITH BESS: CITY OF JOHANNESBURG

	Scenario		
	Current	Plus 20% C&I, 30% residential	Plus 20% C&I, 50% Residential
PV: C&I (MWp)	281	337	337
PV: Residential (MWp)	305	397	458
PV C&I plus residential (MWp)	586	734	795
PV output C&I (MWh/a)	491,983	590,029	590,029
PV output residential (MWh/a)	534,003	695,079	801,880
Total PV output (MWh/a)	1,025,986	1,285,108	1,391,909
PV excess C&I (%)	30%	30%	30%
PV excess C&I (MWh/a)	147,595	177,009	177,009
PV excess residential (%)	30%	46%	53%
PV excess residential (MWh/a)	160,201	319,736	424,996
Total PV excess (MWh/a)	307,796	496,745	602,005
Recommended BESS Power (MW)	250	403	489
BESS duration (hours)	2	2	2
BESS energy (MWh)	500	807	978
Annual PV + BESS Generation (MWh)	397,018	640,274	776,173
Eskom Offset tariff (R/kWh)	2.92	2.92	2.92
Amount paid to IPP (R/kWh)	1.58	1.58	1.58
Net saving (R/kWh)	1.34	1.34	1.34
Annual total savings (Rm)	532	858	1,040

CHAPTER FIVE

POLICY IMPLICATIONS AND RECOMMENDATIONS

5.1. Conclusions

South Africa needs more electricity, more reliable electricity and cheaper electricity. These are basic prerequisites to support higher levels of socioeconomic development and increased standards of living. Reducing the cost of supply is a key (albeit not the only) prerequisite⁶⁰ for municipal electricity distributors to improve financial sustainability, create room for long-term reductions in the real cost of electricity and fund the infrastructure expenditure necessary to improve service levels. The single biggest part (more than 85 per cent) of the cost of supply across municipalities is bulk costs, almost all of which are paid to Eskom. Given Eskom's expected medium-term tariff trajectory – increases well above inflation – the most likely outcome is that financial sustainability and operational performance of municipal electricity distributors will deteriorate further. In addition, substantial Eskom tariff increases drive above-inflation municipal tariff increases, which act to reduce demand (as consumers self-limit) and increase the incentive for illegal connections, all of which add further financial pressure to municipal distributors.

Despite the considerable (and increasing) positive cost differential between Eskom and renewable electricity producers (IPPs), many municipalities struggle to take advantage of this opportunity, for the following reasons:

- Most IPPs want the certainty of multi-year sales agreements and actually receiving payment over the duration of these. They are understandably reluctant to enter into such agreements with financially insecure entities, particularly since the national government's position has consistently been that it will not provide any kind of payment guarantee for these contracts.
- Many municipalities lack the technical and financial skills⁶¹ required to design appropriate renewable energy supply requests for proposals, to evaluate submissions and to draft and manage associated long-term contracts.
- Many municipalities also lack the skills required to manage new utility-scale diversified and intermittent supply, especially when it is being added to an existing aging and unstable distribution infrastructure network.
- The very slow pace of transmission grid expansion means that in many cases, municipal distributors require direct suppliers (who can feed power directly into a municipal system and largely bypass the transmission grid).

At the same time, as the importance of municipalities accessing (more) cheaper electricity supply has grown (and the difficulties of accessing that from large-scale PPPs has not decreased), there has been an explosion in the quantum of installed behind-the-meter solar PV. This is particularly the case in Gauteng: Johannesburg, Ekurhuleni and Tshwane account for just over half of the national total of installed rooftop solar. The majority of these installations are residential, and most of them produce 'excess' electricity on average over a twelve-month period; electricity that could be produced by the system, but which is curtailed because it has no place to go. **This excess electricity is potentially available to municipalities at a rate almost half that which is currently paid to Eskom (on the Megaflex tariff).** We have estimated that the value of that excess power (based on existing installations) could be just over R2.5bn per annum by 2035, to the Gauteng municipalities.

If this excess rooftop solar generation is combined with leased BESS to take advantage of the peak

⁶⁰ Other key factors are reducing technical and non-technical losses and collecting at least a portion of the almost R50bn owed by customers.

⁶¹ Oladejo, O.M., E. Shava and N.C. Ndebele (2025) 'Renewable Energy Adoption: A case of skill gaps in South African local government'. *Frontiers in Sustainable Energy Policy* 4: 1525160.

demand arbitrage opportunity⁶² the costs savings rise exponentially: at current levels of rooftop installation combined with BESS, the City of Johannesburg (City Power) could expect a savings of at least R532 million per annum – without accounting for lower technical losses associated with localised supply. **This saving would allow City Power to increase its capex budget by one third.**

However, the real opportunity for municipalities is to encourage rooftop solar owners (particularly in the residential segment, where the potential is probably greatest) to increase the size of these installations. Almost all of this extra production would be available for sale to a municipality and, when combined with additional BESS, bulk costs savings would increase significantly.

Under a scenario of a 20 per cent increase in installation size by commercial and industrial sites and a 50 per cent increase in installation size on residential sites, the combined annual savings for Johannesburg, Ekurhuleni and Tshwane would be almost R2.5bn per annum – an amount almost equal to the current combined annual capex budgets of those three municipalities.

Of course, these annual savings are still well below than what needs to be achieved to fundamentally shift municipal electricity distribution onto a sustainable financial and operational path. But they represent a **relatively quick and easy win** towards this long-term goal while only limited and slow progress is being made towards addressing the significant challenges that are preventing large-scale renewables penetration in most municipalities. Neither municipal distributors nor their customers can afford to wait before that larger solution materialises: municipal grids are collapsing in real time and economic development potential is consequently being eroded at an accelerating rate.

In summary, the considerable amount of already installed rooftop solar – for which municipalities have not had to incur one cent of expenditure, nor are they responsible for any ongoing operating costs – represents an important source of cost reduction that could be accessed relatively quickly and easily. Despite the potential value of this infrastructure, many municipalities are implementing policies that will likely result in this opportunity being withdrawn.

5.2. Policy recommendations

Addressing the current challenges in the municipal electricity distribution sector and making it ‘fit-for-purpose’ in respect of supporting equitable socioeconomic development, requires a coordinated set of policy actions:

- i. Current strategies to reform the municipal electricity distribution function need to pay closer attention to how municipalities can reduce their operating costs through diversifying bulk cost purchases to include significantly cheaper renewables, including from rooftop solar installations.
- ii. Municipalities need to recognise the significant potential benefits presented by existing rooftop installations and adopt a more cooperative approach to working with – and not in opposition to – installation owners.
- iii. A set of incentives to encourage the sale of excess electricity and an increase in the size of existing installations will create a win-win situation for municipalities and solar PV installation owners, and avoid the worst-case scenario of grid defection.

(i) Current strategies and policies to reform and strengthen municipal electricity distribution must pay closer attention to diversifying bulk purchases to cheaper source of power

Initiatives such as Operation Vulindlela and National Treasury’s Trading Services Reform programme aim to improve the financial sustainability and operational performance of municipal electricity utilities. Tools include ringfencing revenue and expenditure, and incentivising improvements in financial and operational governance. Although these are necessary interventions, given the financial reality of electricity trading and the significant infrastructure backlogs that need to be funded, these programmes should also include facilitating significant reductions in bulk costs. In addition, neither of these strategies includes achieving real long-term reductions in electricity tariffs – a key prerequisite for increasing broad-based socioeconomic development. Lower bulk costs are a precondition for lower tariffs.

As discussed in this report, bulk costs currently equate to more than 85 per cent of total municipal electricity revenue. A reduction in this ratio is a critical factor to enable municipalities to reduce operating deficits, allocate greater amounts to infrastructure maintenance and create the possibility of long-term reduction in real tariffs. **Lower relative bulk costs can be achieved by a combination of reducing technical and non-technical losses and sourcing a greater share of cheaper bulk supply.** Both strategies are necessary to achieve the interlinked goals of financial sustainability, increased supply, quality service and more affordable electricity tariffs in municipalities.

While current policies do focus on reducing losses, they do not focus specifically on encouraging and facilitating a reduction in the unit cost of bulk purchases. Under the current Eskom price trajectory, the only way that bulk costs can be reduced is by diversifying bulk purchase to include a greater share of significantly cheaper renewables and battery storage (BESS) to maximise the cost-saving benefit of that electricity.

Most municipalities currently face significant obstacles to entering into long-term purchase agreements with IPPs. As a longer-term strategy, both Operation Vulindlela and National Treasury’s Trading Services Reform programme should include clear actions to address these issues. In the short-term, however, there is an important opportunity available to several municipalities – notably the metros in Gauteng – to rapidly develop and implement local programmes to purchase as much power as possible from existing rooftop solar PV installations, and to leverage these further by contracting with BESS IPPs. Municipalities should be incentivised to fast track such programmes and national government should further support these efforts by facilitating the incentives set out in (iii) below.

While current policies do focus on reducing losses, they do not focus specifically on encouraging and facilitating a reduction in the unit cost of bulk purchases.

⁶² Purchasing power at the much cheaper rate, storing it and then discharging it during the morning and evening peak periods to avoid a portion of the Eskom peak demand charge.

(ii) A more cooperative approach by municipalities

Municipalities need to adopt a more cooperative approach towards rooftop solar owners, rather than the current oppositional approach common in many municipalities which is based on the fundamentally flawed assumption that rooftop solar is the main reason for current financial problems. The current approach of forcing installation owners onto more expensive tariff structures, to incur additional system compliance costs and to carry the full cost of new meters, against a backdrop of rapidly increasing electricity tariffs and the availability of substitute energy sources such as gas, is almost certain to drive much higher rates of grid defection.

Grid defection is the worst possible outcome for a municipality: not only do they lose customers entirely – and the main method of credit management for other municipal services – but they will lose access to a considerable amount of cheap power-producing infrastructure paid for and maintained by a third party.

Municipalities need to create a situation where rooftop solar PV owners are happy to enter into a sales agreement with the municipality and to increase the size of their installations. This will not happen under the current municipal view of these entities as the opposition.

A recent study in Gauteng found that 40 per cent of survey respondents who owned rooftop solar would consider feeding their surplus power back into the grid **at a zero tariff**.⁶³ However, this kind of cooperative approach is unlikely to materialise at scale, unless municipalities adopt a different approach and supporting incentives are in place.

(iii) Incentives to encourage grid feed-in and disincentivise grid defection

A key part of a different relationship between municipalities and rooftop solar PV owners is a set of incentives that will encourage these owners not just to sell excess power to the municipality, but also to be willing to increase the size of their installations. Incentives could also be designed to maximise the possibility that smaller installation owners – for whom the monthly feed-in tariff would probably be relatively low – do, in fact, consider a zero-feed in tariff, since the financial benefits to municipalities would be considerable.

This report recommends that the following incentives are investigated in more detail:

- a. Streamline and reduce the cost of the system-registration process. In particular, unnecessary costs that are unrelated to the system safety of the installation (such as engineering reports specifying the load bearing capacity of a roof) should be eradicated. The goal should be to make it as cheap and easy as possible to register a system, while limiting any risk to the grid.
- b. Subsidise the cost of the bidirectional meter, include prepaid bidirectional meters. The unsubsidised portion of the cost can be offset against the first six months of feed-in tariffs, but where the owner has agreed to feed in power at a zero fee, the meter should be 100 per cent subsidised.
- c. Allow rooftop solar owners to remain on existing prepaid billing structures if they agree to a zero feed-in tariff for the existing (registered) installation.
- d. Increase the incentive (in both percentage and upper limit of expenditure) for additional panels to be added to existing (registered) installations. Installations that are increased under this scheme can benefit from a feed-in tariff while remaining on a prepaid system. That is, the system incentivises both zero feed-in tariffs for owners unwilling to increase installation size and those who are willing to do so.

⁶³ Lemanski, C., C. Culwick Fatti and F. Anciano (2026) 'Climate Justice or Climate Apartheid? The justice trade-offs of private solar investments for South Africa's just transition'. *Political Geography* 126: 103512.



Some of these incentives (especially the last one) will be complex to manage accurately, particularly in respect of billing systems. Therefore, it would be important for National Treasury's Trading Service Reform programme to assist municipalities with creating the necessary capabilities to design and manage these new systems.

The opportunity to extend benefits to township areas

Although this report has not focused on this issue, once a municipality (particularly a larger metro municipality) has established the regulatory and infrastructure framework for large-scale purchases of excess electricity from dispersed sites, there is an opportunity to further diversify supply, reduce bulk costs and create broad-based community benefits through the installation of large numbers of solar panels in low-income/township areas. The summary details of how such a project could work are as follows:

- Panels (we estimate an average of 3kW of panels per household) will be installed and maintained by a third party,⁶⁴ who will sell the electricity to the municipality.
- Households with panels will receive a monthly rental, paid either in cash or in free electricity units, or a combination thereof. In addition, they could also be shareholders in the IPP that installs the panels and sells the electricity to the municipality.
- Municipalities can increase the benefits of this electricity by leasing additional BESS capacity and benefiting from the peak demand arbitrage (as detailed above).

⁶⁴ This is the lowest risk, lowest capital expenditure solution for both households and the municipality.

PARI

PUBLIC AFFAIRS
RESEARCH INSTITUTE

2 Sherwood Road
Forest Town
Johannesburg, 2193

T +27 (0) 11 482 1739
E info@pari.org.za

www.pari.org.za

