Household tipping points in the face of rising electricity tariffs in South Africa

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Household tipping points in the face of rising electricity tariffs in South Africa

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Abstract: Since the start of sharp electricity tariff increases in 2008, South African household demand for electricity has not been significantly affected. However, the combination of economic realities and ongoing electricity tariff increases will eventually compel households to reduce their electricity usage. This research explores the ability of South African households to make alternative-energy and/or energy-efficient investments in two tariff increase scenarios. It is found that middle-income households are the most vulnerable to rising electricity tariffs, due to their limited ability to invest in technologies that would significantly reduce their electricity usage, yet they are unlikely to opt for the alternatives used by low-income households. Assuming that 20 per cent of households that can afford to invest in particular technologies do so, then around one quarter of total residential electricity sales in South Africa could potentially go off-grid in the base case tariff scenario by 2030.

Keywords: demand-side management, affordability, aggregate electricity demand, investment decisions, low-income households
JEL classification: D12, L51, L94, R22

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1 Introduction

Given the importance of electricity for basic needs such as cooking, heating, and lighting, it is important for welfare and economic reasons that households have consistent access to electricity and that electricity tariffs are not prohibitively expensive. In South Africa, the latter issue has become a concern in recent years, as electricity tariffs have been increasing substantially above inflation. Between 2008–09 and 2016–17, electricity prices increased by an average of 11.1 per cent per year in real terms.[1] This is particularly challenging for South African households given the country's developmental challenges, which include high levels of income inequality, unemployment, and poverty. Eskom, the state-owned and integrated monopoly electricity provider, has stated that electricity tariffs will have to continue to rise in real terms in order to be financially viable (Makgetla 2017). While electricity spend is a relatively small proportion of a South African household's total consumption expenditure (2.3 per cent of average expenditure in 2010) (StatsSA 2012), it is critical for household activities. Consequently, household demand for electricity has remained relatively inelastic (Inglesi-Lotz and Blignaut 2011). Nevertheless, the combination of continued electricity price increases, persistently high levels of unemployment, and generally eroded household disposable income could result in households making certain decisions regarding their electricity consumption, including:

i. *Reducing electricity usage and improving energy efficiency*. Examples of this include turning down the geyser and switching off non-essential appliances. However, many South African households have already adopted this behaviour (Department of Energy 2014), and there are limits to the benefit that it can provide to households.

ii. *Replacement of existing electrical appliances with non-electrical ones, or with appliances with significantly lower energy consumption*. While many households have already invested in some technologies (Department of Energy 2014), such as compact fluorescent lightbulbs for example, there is still potential for further investments in LED bulbs, solar geysers, and gas appliances.[2] Poorer households may return to more basic sources of energy generation such as wood and paraffin, which have a number of environmental and welfare implications.

iii. *Cutting other expenditure*. Whilst households may choose to reduce expenditure in other areas to make allowances for rising electricity costs, this can only be done to a limited extent, and will likely only be pursued once other electricity cost-saving measures have been put in place.

iv. *Meter tampering and connecting illegally*. Non-technical load losses are prevalent in certain municipalities in South Africa as difficult economic conditions have led to high levels of electricity theft (Eskom 2014). Continued tariff increases coupled with weak economic growth will likely exacerbate this situation. However, better enforcement and the increased roll-out of prepaid meters may curb this behaviour to some extent (Maphaka et al. 2010).

While these decisions will have a positive effect on household disposable income, there are potentially negative consequences. As households begin to demand less electricity, or choose not to pay, electricity revenues at municipalities and Eskom will be affected. The objective of this paper

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[1] Authors' calculation, based on decisions by the National Energy Regulator of South Africa.

[2] Piped gas is limited to a few suburbs in South Africa, so the bulk of cooking appliances are electric. Some higher-income households have moved towards gas cooking appliances requiring gas bottles.

is to quantify the impact of household decisions around mitigating the effect of rising electricity tariffs.

Section 2 of this paper explores existing literature on elasticity of electricity demand, the impact of rising electricity tariffs on households, household investment in electricity efficiency, and electricity tipping points. Section 3 explains the tariff path assumptions. This is followed by an analysis of the effect of tariff increases on the disposable income of South African households in Section 4, and then the potential for households to reduce their electricity demand through particular investment decisions in Section 5. Section 6 highlights the potential loss in electricity demand that electricity suppliers, namely municipalities and Eskom, could experience. Finally, recommendations are provided in the concluding remarks in Section 7. It must be noted that there are a number of assumptions that are made and caveats that need to be kept in mind due to the approach used. These are highlighted throughout the paper.

2 Literature review

This research examines how sensitive South African households are to increases in the cost of electricity, relative to the costs of investing in appliances and technologies that reduce their need for grid-based electricity. While there have been a few other studies calculating the elasticity of demand for electricity, we find that that these studies are relatively outdated, and they use pricing data points during the years of South Africa's electricity supply crisis and the global financial crisis—which makes it difficult to separate out other effects from a pure price effect (Deloitte 2011). Inglesi and Pouris (2010) used Engle-Granger methodology to model South African electricity demand using data for 1980–2007, and found that in the short run firm demand for electricity is influenced by economic and population growth, whilst in the long run income and the price of electricity are larger determinants. In 2014, Inglesi-Lotz concluded that households will increasingly focus their efforts on demand-side management or turn to other sources of cheaper energy, depending on the level of household income. These studies recommended that changing levels of elasticity, or tipping points, should be examined in more detail.

There has been international and South African research on energy efficiency investments as a way to improve the welfare of low-income households. A study commissioned by the European Parliament analysed the impacts that energy efficiency has on low-income households across Europe (Ugarte et al. 2016). It found that the rise of energy poverty is largely due to a lack of investment in energy efficiency and appropriate social welfare, particularly in Eastern European states. Overall, it was concluded that energy efficiency policies that target low-income households have positive social impacts and are more effective in reducing energy poverty than social policies alone. The importance of information campaigns and the introduction of tax credits for energy efficiency investments was highlighted, as uptake of energy efficiency by low-income households was found to be lower than expected.

Ameli and Brandt (2014) explored why energy efficiency investments are often not taken up by households, despite their positive impacts on household welfare. Using OECD survey data, they found that that households' likelihood of investing in electricity-efficient technologies depends largely on home ownership, income, social context, and household energy practices. It was determined that households tend to give a much larger weight to the high upfront costs of energy efficiency investments than to the long-term positive financial impacts. This is an important finding to take into consideration for this research. However, behavioural decisions by South African households may be different, given the extent of income inequality, the level of electricity tariff increases, and previous experience with economy-wide load shedding in 2008.

South Africa's Department of Energy (2012) highlighted that almost three quarters of households in the poorest quintile are energy poor, as are 12 per cent of households in the richest quintile. At the same time, they found that only 20 per cent of households are aware of how they can save electricity. This is an important point to consider regarding households' likelihood of making decisions around electricity cost savings. A 2010 National Economic Development and Labour Council study focused on subsidy support for poor households in light of the imminent tariff increases at the time; it did not focus on technology choices as a way to reduce the negative impacts of tariff increases, which the current study attempts to do.

The scope for energy efficiency amongst households in South Africa was quite large at the time of South Africa's electricity supply crisis in 2008, according to Altman et al. (2008). It was found that there was significant scope for energy efficiency improvements by households and industry: savings of between 15 and 20 per cent could be possible, and higher-income groups had more opportunities for power saving through using solar panels, geyser blankets, low-energy light fittings, gas heating/cooking, and micro wind turbines, amongst others. In a later study, Franks (2014) conducted a survey of township residents and suggested that if poor households in informal settlements face above-inflation tariff increases in the future, paraffin use will rise. Yet it was concluded that it is unlikely that households will stop using electrical appliances that they already own, given the sunk cost already committed to, in addition to the fact that households might not easily change their habits with tariff increases.

There are also studies on the implications for electricity providers of households switching to renewable technologies. A case study on rooftop photovoltaic (PV) installations for residential and industrial use by the Drakenstein municipality (Kritzinger and Meyer 2015) concluded that private PV installation will likely have less of an impact on municipal incomes than is commonly believed, in the short term. It was noted, however, that a breakthrough in the costs and practicality of battery storage technology could be a leap enabler, leading to a large-scale increase in largely self-sufficient consumers. One drawback of this study is that it only focuses on solar PV uptake, and does not look at the adoption of other appliances, which the current study does. A similar case study was done for the Stellenbosch municipality in South Africa. Korsten et al. (2017) found that the municipality could have lost 2.4 per cent of its total municipal electricity revenue in the 2013–14 financial year if all households that were able to do so, from a technical perspective, had invested in rooftop solar PV. Unlike the current research, these studies focus on a particular area and technology.

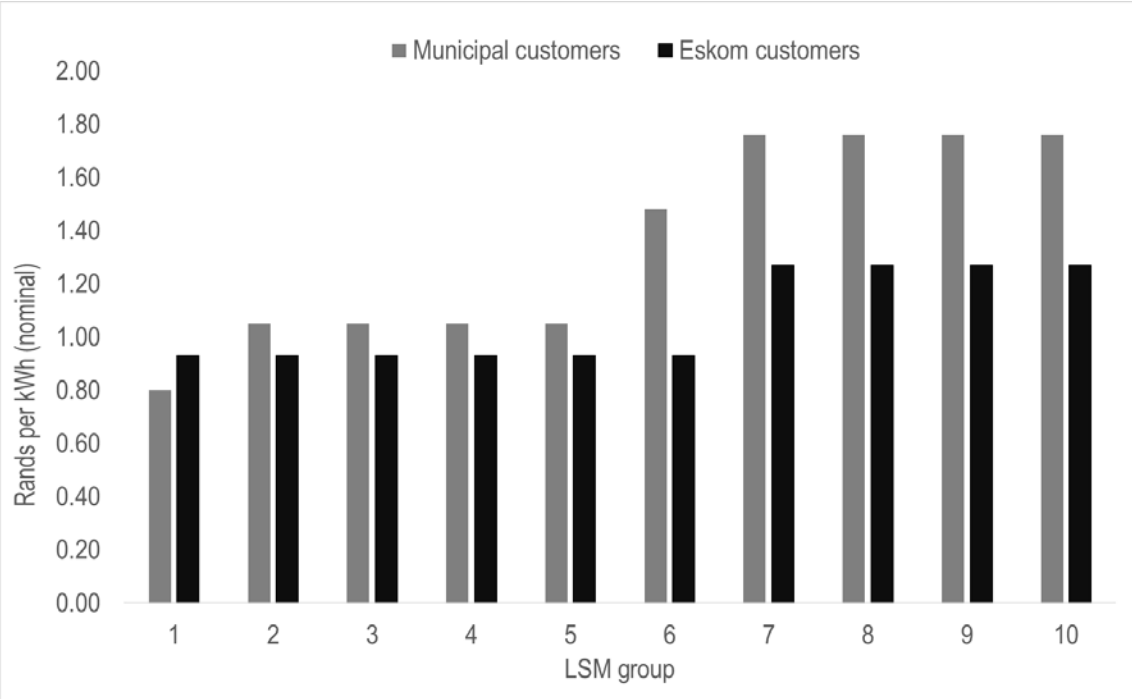
South Africa's Financial and Fiscal Commission evaluated the impacts of electricity price increases on municipal tariffs and revenues (Peters n.d.). Using municipal data from the South African Treasury, it found that there is a negative relationship between electricity tariff increases and municipal revenue. The study also highlights the fact that this situation is concerning, given that municipalities have grown reliant on their electricity tariff profits to fund other, non-electricity-related activities.

This research complements research by Goliger and McMillan (2018), which uses a simple financial model to determine the ability of specific large companies to self-generate electricity and the impact that this could have on Eskom. There has been little local empirical research on the ability of households to invest in appliances and technologies that reduce their demand for grid-based electricity; in part this is because the cost of making these investments, particularly solar PV and solar water geysers, has been prohibitive for households. However, with the increasing electricity price trajectory in South Africa and the falling cost of alternatives, it is useful to reassess the situation. This study also attempts to aggregate household-level decisions to determine the impact on sales by electricity providers.

3 Tariff paths

About 75 per cent of households get their electricity from municipalities, with the remainder being Eskom customers (Eskom 2016). Municipal customers tend to face higher electricity tariffs (Figure 1), due a regulated surcharge to cover the cost of distribution. Further, municipalities implement cross-subsidies to lend support to lower-income households.

Figure 1: Average tariffs for municipal and Eskom customers in 2015 by Living Standards Measure group in rand per kilowatt-hour (nominal)

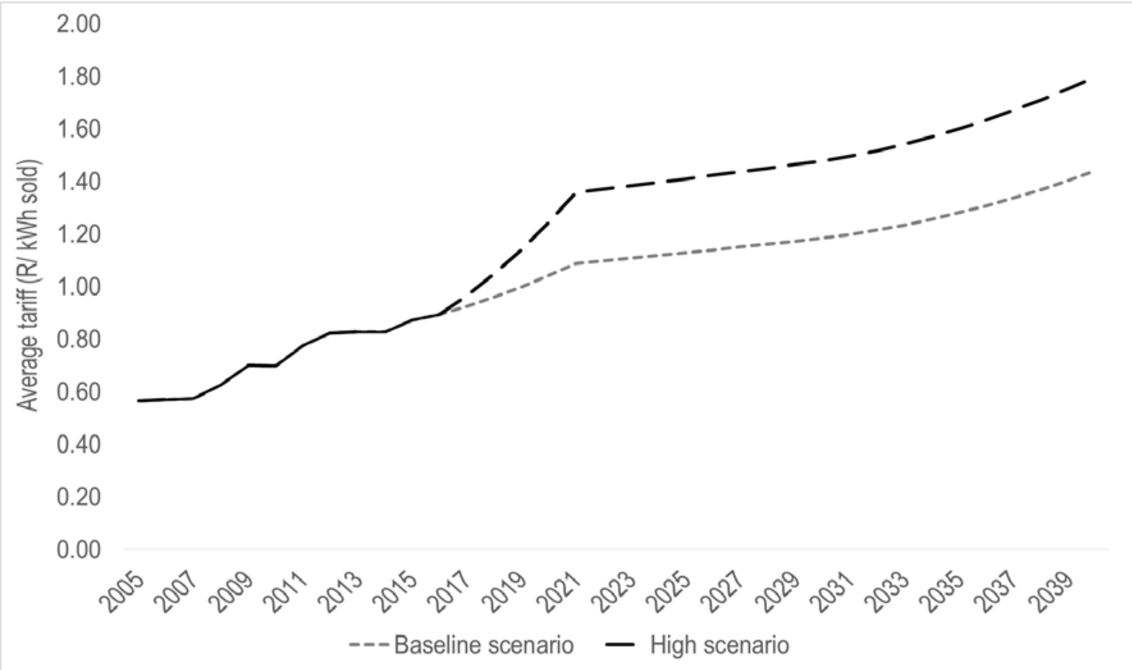


Note: Based on tariff blocks. Living Standards Measure (LSM) is a research tool used in South Africa to classify income and living standards (South African Audience Research Foundation 2012).

Source: authors' illustration based on tariff decisions of the National Energy Regulator of South Africa (2015).

The current research looks at two electricity tariff path scenarios: a baseline and a high-tariff scenario (Figure 2). The lower, baseline scenario assumes that electricity tariffs will increase by 10 per cent per annum in nominal terms in 2017–21, and from 2022 it is assumed that tariffs will grow by inflation. In the high-tariff scenario, it is assumed that electricity tariffs will grow by 15 per cent per annum in nominal terms in 2017–21, thereafter growing by inflation.

Figure 2: Impact of chosen tariff scenarios on Eskom's average residential tariffs in rand per kilowatt-hour (real)



Source: data from Eskom (n.d.) and authors' calculations.

As Eskom and municipal tariffs are different, due to the municipal tariff surcharge, in essence four electricity tariff paths are modelled in this study: an Eskom baseline tariff, a municipal baseline tariff, an Eskom high tariff, and a municipal high tariff. Table 1 illustrates the actual average tariffs in 2015 as well as the projected tariffs by 2030, using the assumptions above.

Table 1: Comparison of tariffs faced by residential customers in rand per kilowatt-hour (real)

	2015	2030 (projected)
Eskom baseline	0.87	1.18
Municipal baseline	1.05	1.42
Eskom high	0.87	1.48
Municipal high	1.05	1.77

Source: National Energy Regulator of South Africa (2015), Eskom (n.d.), and authors' calculations.

4 The impact of rising tariffs on household income

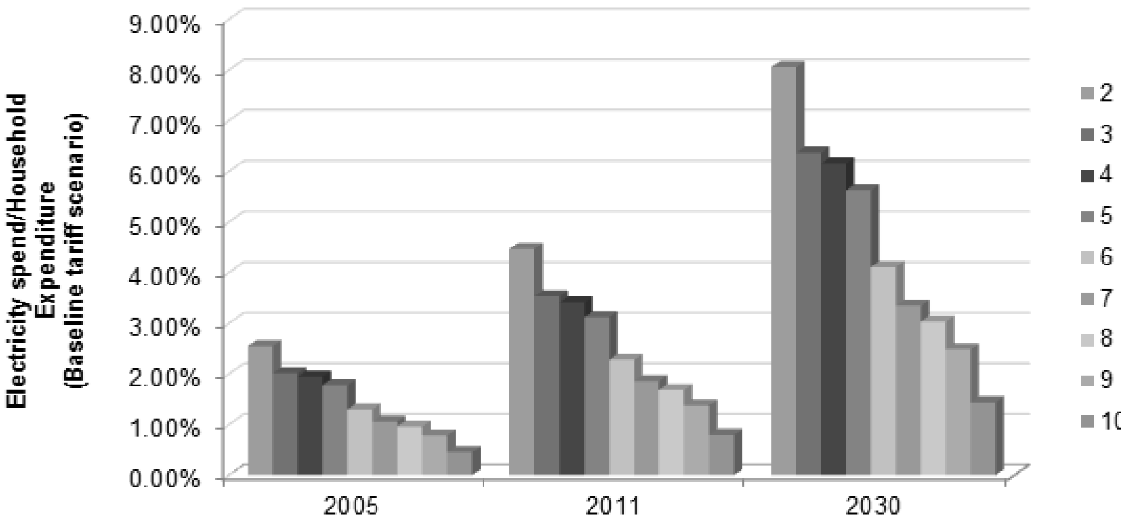
In this section, the electricity tariff increase scenarios are applied to average household electricity expenditure for each income decile, obtained from South Africa's statistical agency (StatsSA 2012). This provides projections of future household spend on electricity per decile, under the assumption that household electricity demand stays constant over the period of analysis. Household income is assumed to grow at a constant and homogenous rate across the income deciles.

Figure 3 illustrates electricity expenditure as a proportion of household expenditure for income deciles 2–10 for 2005, 2011 (actual), and 2030 (projected).[3] Across all deciles, electricity spend

[3] It is assumed that income increases by around two per cent per year in real terms from 2011. Decile 1 is excluded from the analysis, as electricity expenditure data for this decile is unreliable.

almost doubles by 2030; however, lower-income households are the most affected, as electricity represents a larger proportion of their expenditure basket. For example, households in decile 2 spend 4.5 per cent of their total household income on electricity in 2011. By 2030, this rises to 8.1 per cent in the baseline tariff scenario. It must be noted that only the direct impact of electricity price increases is considered. In other words, the 'triple effect' of an increase in food, transport, and electricity costs, highlighted by Franks (2014), is not included. The significant increase in future electricity expenditure implies that it is very likely that households will start looking at ways to cut their electricity bills if they have not begun to do so already.

Figure 3: Electricity expenditure as a percentage of household income by decile in the baseline tariff scenario



Source: StatsSA (2008, 2012) and authors' calculations.

5 The ability of households to invest in appliances and technologies that reduce their demand for grid-based electricity

The second aspect of this study looks at the ability of households—this time grouped by Living Standards Measures (LSM)—to invest in a particular basket of appliances or technologies that enables households to reduce their reliance on grid-based electricity. LSM income levels are closely aligned with the income deciles in StatsSA's Income and Expenditure Surveys. Data on average household electricity consumption by LSM was obtained from Eskom, and it is assumed that household electricity consumption remains constant over the whole period of analysis. Essentially, there is one representative household in each LSM group. Feasibility assessments for each of the selected technologies[4] are conducted in the tariff scenarios. Operation, maintenance, and replacement costs of the appliances (or technologies) are included.[5] These investment choices have a positive net present value in all electricity tariff scenarios, even from 2016, the first year of investment. In other words, it already makes financial sense for representative households to invest in these technologies, as the investment costs are outweighed by electricity cost savings (in South

[4] LED light bulbs, gas heater, solar water geyser, two-burner gas stove, four-burner gas stove and oven, and rooftop solar PV. Price and product information was obtained from the websites of major retailers such as Game and Makro, as well as from businesses specializing in the installation of solar water geysers and rooftop PVs.

[5] For example: purchase of gas, replacement of light bulbs, annual maintenance of solar PV system, etc.

African rand). Next, these individual technologies are grouped into four distinct 'baskets' that the representative households can choose from (Table 2).

Table 2: Description of technology baskets and their impact on household electricity consumption[6]

Basket	Contents	KWh savings p.a	Average avoided electricity costs per household p.a (Rands)
1	gas hotplate; 5 LEDs; gas heater	1 878	2 539
2	four plate gas stove & oven; 10 LEDs; 2 gas heaters	4 852	6 560
3	four plate gas stove & oven; 10 LEDs; 2 gas heaters; solar water heater	6 875	9 213
4	rooftop solar PV system	6 300	8 518

Source: authors' calculations.

While these investments yield a positive net present value for households, this does not imply that all households will be able to invest in all baskets, as affordability is a consideration. For the purposes of this study, it is assumed that a representative household in a particular income bracket will only invest in these technologies at the point in time when the costs in the first year of investment are equal to, or less than, five per cent of annual household income (per LSM group). In other words, it is assumed that households behave rationally and are willing to bear slightly higher expenditure in the initial years in return for future savings. For example, if the initial year of investment is 2017, and the net cost of investment in Basket 2 equates to 6.3 per cent of a representative household's income in that year, then it is assumed that the household will not invest. But if in 2019 it costs 4.9 per cent of household income to invest, then the model determines that the household will choose to invest in Basket 2 in 2019. In this way, the electricity tariff tipping points of various LSM groups can be modelled.

It should be noted that because municipal tariffs are higher than Eskom's tariffs for middle- to high-income households, municipal customers are likely to reach tipping points earlier. It is assumed that only households in LSM 1 to LSM 6 will select Basket 1, as it is more suited to low-income households. A limitation of this study is that each LSM group is represented by a household with the mean income for that LSM, for the purposes of simplification. Households at the upper and lower ends of that same LSM group will have different tipping points.

Table 3 illustrates the tipping points in two extreme tariff scenarios: (i) Eskom tariffs under a base case tariff path, and (ii) municipal tariffs under a high tariff path.

[6] The kilowatt-hour savings in Table 2 incorporate many assumptions around household usage of appliances, e.g., it was assumed that households use a gas heater for an average of five hours per day for three months of the year.

Table 3: Household tipping points per basket in low- and high-tariff scenarios

	Eskom base tariff (low scenario)	Municipal high tariff (high scenario)
Basket 1	• From 2017: LSM 1-6 can afford to invest	• From 2018: LSM 1-6 can afford to invest
Basket 2	• From 2021: LSM 7 -10 can afford to invest • From 2030: LSM 6 can afford to invest.	• From 2017: LSM 7 – 10 can afford to invest • From 2020: LSM 6 can afford to invest. • From 2029: LSM 5 can afford to invest • From 2034: LSM 4 can afford to invest
Basket 3	• From 2023: LSM 7 -10 can afford to invest.	• From 2018: LSM 7 -10 can afford to invest.
Basket 4	• From 2024: LSM 7 -10 can afford to invest.	• From 2018: LSM 7 -10 can afford to invest.

Source: authors' calculations.

Table 3 shows that the tipping point for many low-income households has already been or will soon be reached.[7] It is likely that many of these households have already made investments in Basket 1-type goods. Furthermore, the model shows that municipalities are likely already facing a decline in electricity sales to high-income households. This is corroborated by Peters (n.d.). Lower tariffs faced by Eskom customers delay the tipping points by between four and six years.

In a high-tariff scenario, household electricity expenditure can become so significant that even low-income households (in LSM 4, LSM 5, and LSM 6) will view Basket 2 as relatively affordable. Middle-income households (particularly in LSM 5 and LSM 6) will be the most vulnerable to rising electricity tariffs. This is because they are unlikely to invest in Basket 1, as their electricity usage is too high, or else they have a preference for appliances beyond those available in Basket 1 but find Baskets 3 and 4 prohibitively expensive.

6 Implications for broader electricity demand

Altman et al. (2008) stated that while at an individual level household electricity consumption is fairly small, at aggregate household electricity consumption is significant. To test this assertion, this section aggregates the previous findings for representative households in each LSM bracket.

Although the average household in a particular LSM may be able to afford a specific basket, it is unlikely that all households in that LSM will decide to invest in a basket.[8] For the sake of simplicity, this research assumes that for each basket, 20 per cent of households that can afford to do so will invest. As Baskets 2, 3, and 4 are generally affordable for higher-income households, this assumption implies that 60 per cent of higher-income households will choose to invest in one basket or another.[9] Overall, this assumption translates to 35 per cent of all households in South Africa choosing to invest in one basket or another, and the remaining 65 per cent of households not investing in any basket at all (Figure 4).

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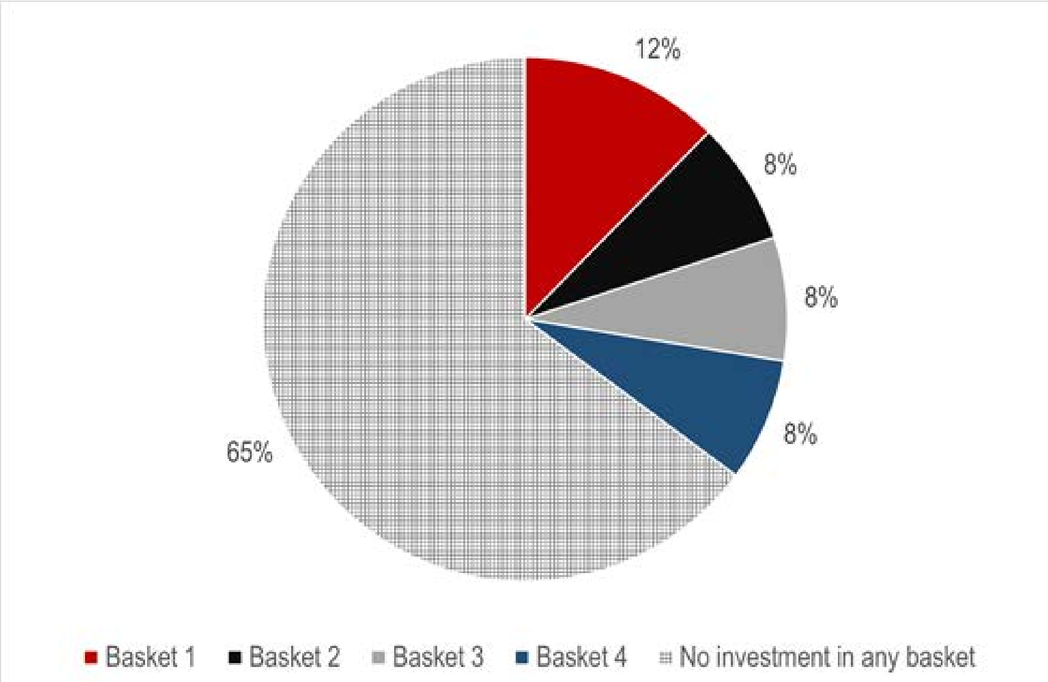
[7] It must be noted that municipalities have lower tariffs for low-income households (through cross-subsidies), which accounts for the delayed tipping point for low-income households in the municipal tariff scenario.

[8] This may be for various reasons, such as household position at the lower end of the income bracket of the LSM; safety concerns (e.g., around gas usage); building/sectional title regulations; a lack of knowledge of technologies; other expenditure priorities; etc.

[9] For example, for LSM 9 it is assumed that 20 per cent of households will invest in Basket 2 only, another 20 per cent in Basket 3, and 20 per cent in Basket 4. Therefore, this implies that the remaining 40 per cent of households in this LSM will not invest in any basket, even though it makes financial sense.

Figure 4: Assumptions regarding uptake of technology baskets, as a percentage of total households



Source: authors' calculations.

The following formula is used to determine the implications of the above findings and assumptions for broader energy demand:

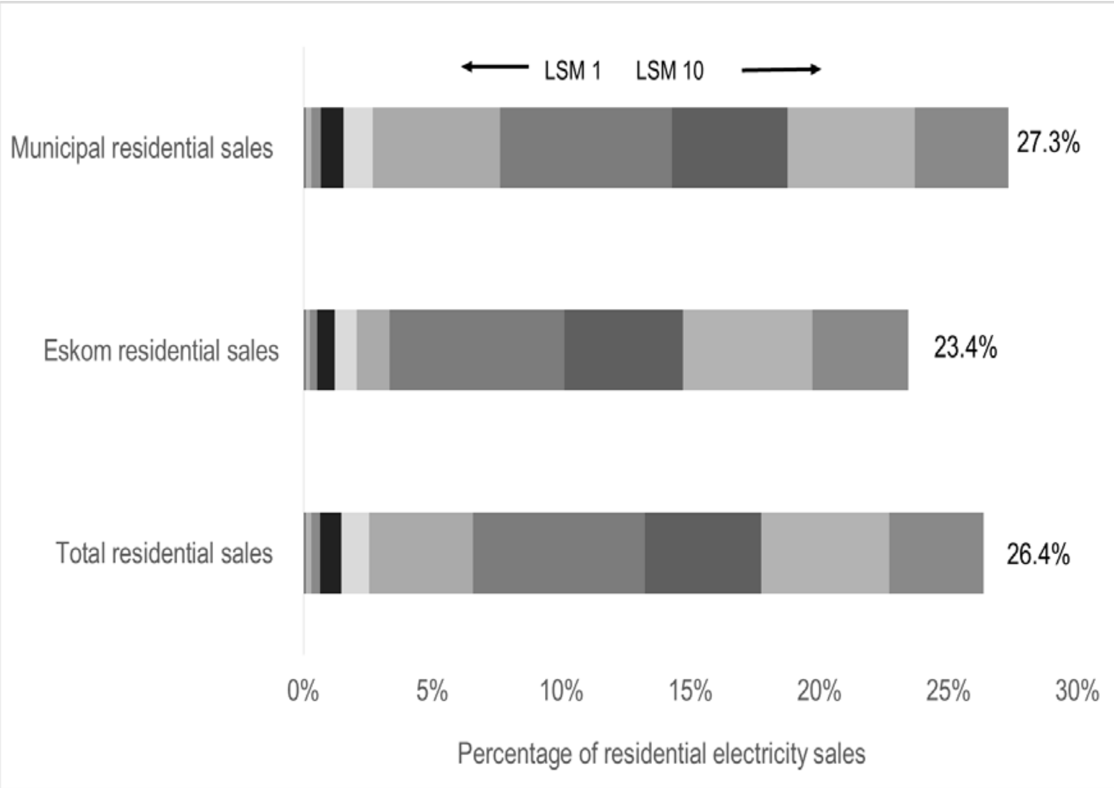
> Average electricity saved per household per basket **x** number of households in each LSM group **x** 20% (uptake assumption) **x** (proportion of Eskom customers + proportion municipal customers)
>
> = Total electricity demand that could potentially go off-grid

We find that 26.4 per cent of total residential electricity sales could go off-grid, assuming that 35 per cent of households will invest in one basket or another. As a proportion of Eskom and municipal sales,[10] respectively 23.4 and 27.3 per cent of sales are likely to go off-grid by 2030 (Figure 5). The bulk of the shift will come from LSM 6 to LSM 10.[11]

[10] Data supplied by Ms F. Salie, researcher at the University of Cape Town's Energy Research Centre, 8 September 2016.

[11] Low-income households represent roughly a third of total electricity consumption; the remainder is consumed by households in LSM 7–10.

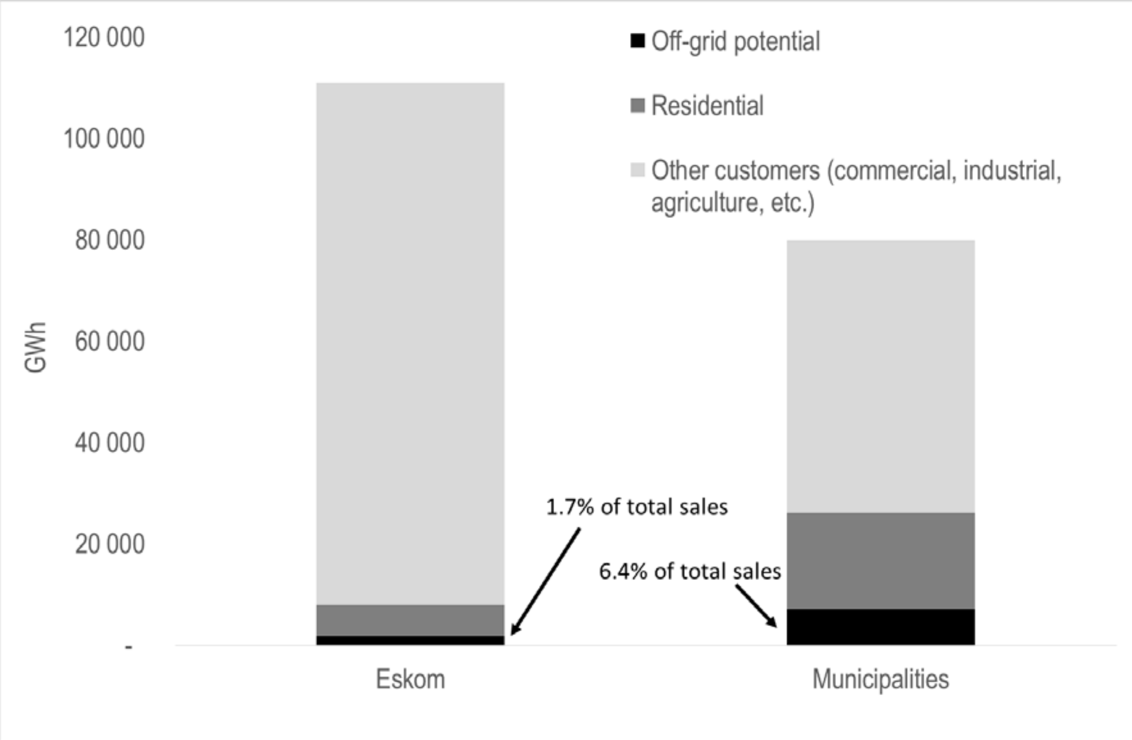
Figure 5: Forgone residential electricity sales due to a 20 per cent uptake, as a percentage of electricity sales



Source: authors' calculations.

These impacts are then compared with aggregate electricity sales by Eskom and municipalities. From Figure 6, it can be seen that a 20 per cent uptake by households represents a relatively small proportion (1.7 per cent) of Eskom's total electricity sales. For municipalities, the impact is nearly four times larger. Municipalities could lose 6.4 per cent of their sales to off-grid investments in the baseline scenario. This will also have an impact on Eskom, as it is the supplier of the power that municipalities sell.

Figure 6: Size of impact of uptake in 2030 relative to total Eskom and municipal electricity sales in 2015—baseline scenario



Note: GWh: gigawatt-hours.

Source: Eskom (2016) and authors' calculations.

7 Concluding remarks

Given that electricity is essential for basic activities, households are vulnerable to the cost of electricity—especially those in lower income brackets. It is important to understand how the cumulative effect of annual tariff increases could impact households. This is a particularly important topic for South Africa, which has high levels of income inequality and poverty, coupled with the above-inflation electricity tariff increases that are required to sustain the national electricity utility. At the same time, technological developments, and the falling cost of technologies such as rooftop PV systems, batteries, solar roof tiles, etc., imply that electricity demand is becoming more elastic and households are becoming less reliant on utilities. This trend towards decentralized energy production will bring about significant structural changes to the electricity sector (Korsten et al. 2017), globally and in South Africa.

This study analyses the effect that future increases will have on household disposable income, and the options that households have to mitigate this impact from an investment perspective. Further, an attempt is made to quantify the impact of this shift on municipalities and Eskom as residential customers move off the grid. These objectives are important, considering the level of poverty and inequality in South Africa, the trends in electricity tariffs in recent years, and concerns around the sustainability of the national electricity utility and municipalities—which rely on electricity sales as a source of revenue. It is found that even if electricity tariffs follow a moderate tariff path, disposable income will be significantly affected if South African households continue consuming electricity at current levels. As we have shown, electricity expenditure almost doubles by 2030 across most income deciles.

Looking at the ability of households to reduce their electricity consumption through investments in 'off-grid' appliances and technologies, it is determined that for many households, tipping points will be reached within the next few years as the relative costs of these investments fall. A high tariff path will accelerate this process. Middle-income households will be the most vulnerable to rising tariffs.

Looking from an aggregate perspective, it is estimated that the above tipping points could reduce total residential electricity sales by 26.4 per cent in the base case scenario. Eskom could lose 1.7 per cent of their own residential sales, while municipalities could lose 6.4 per cent of their residential sales. While the impact on total electricity sales may not be very significant on its own, it must be considered in a broader context: the bulk of the impact on electricity sales will come from commercial and industrial customers. They have the scale and finance capabilities to undertake these investments—even more so than households.

In light of these trends, electricity providers around the world have to figure out how they can become more sustainable. This is an opportunity for South African municipalities to broaden their revenue streams and possibly invest in renewable strategies. For Eskom, there needs to be a reconsideration of its current structure. At the same time, consideration needs to be given to households that are vulnerable to rising electricity tariffs, particularly middle-income groups. Investments in off-grid technologies should be encouraged.

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Appendix: additional tables

Table A1: Description of technology baskets and their impact on household electricity consumption

Basket	Contents	KWh savings	% of average household consumption by LSM										Avoided electricity costs, municipal tarriff scenario (Rands)									
			1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1	Gas hotplate 5 LEDs Gas heater	1 878	112%	93%	82%	64%	49%	31%	24%	22%	14%	9%	1 502	1 972	1 972	1 972	1 972	2 779	3 305	3 305	3 305	3 305
2	Four plate gas stove & oven 10 LEDs 2 gas heaters	4 852	289%	239%	211%	164%	126%	81%	63%	56%	36%	23%	3 882	5 095	5 095	5 095	5 095	7 181	8 540	8 540	8 540	8 540
3	Four plate gas stove & oven 10 LEDs 2 gas heaters Solar Water Heater	6 875	409%	339%	298%	213%	163%	115%	90%	79%	51%	33%	5 500	6 394	7 219	7 219	7 219	10 175	12 100	12 100	12 100	12 100
4	Solar PV	6 300	375%	311%	273%	213%	163%	105%	82%	72%	47%	30%	5 040	6 615	6 615	6 615	6 615	9 324	11 088	11 088	11 088	11 088

Source: data from Eskom (n.d.) and authors' calculations.

Table A2: Data on electricity usage and spend by LSM

LSM	Average consumption per annum (kWh)	Municipal tariff, 2015 (Rands per kWh)	Eskom tariff, 2015 (Rands per kWh)	Total electricity spend per annum - municipal customers (Rands)	Total electricity spend per annum - Eskom customers (Rands)
1	1 680	0.80	0.93	1 344	1 562
2	2 028	1.05	0.93	2 129	1 886
3	2 304	1.05	0.93	2 419	2 143
4	2 952	1.05	0.93	3 100	2 745
5	3 864	1.05	0.93	4 057	3 594
6	5 976	1.48	0.93	8 844	5 558
7	7 680	1.76	1.27	13 517	9 754
8	8 724	1.76	1.27	15 354	11 079
9	13 492	1.76	1.27	23 747	17 135
10	20 867	1.76	1.27	36 726	26 501

Source: Eskom (n.d.), National Energy Regulator of South Africa (2015), and authors' calculations.

Table A3: Characteristics of households in each LSM

LSM	Characteristics of households	LSM	Characteristics of households
1	● Traditional hut dwelling ● Minimal access to services ● Ownership of a radio	6	● Large urban house/ townhouse ● Electricity, water in home, flush toilet in home ● TV sets, stove, fridge/ freezer, microwave
2	● Traditional hut/ shack ● Communal access to water ● Ownership of radio and stoves	7	● Urban dwelling ● Full access to services ●Full ownership of durables, incl. motor vehicle
3	● Traditional hut/ shack ● Communal access to water ● Ownership of radio and stoves	8	● Urban dwelling ● Full access to services ● Full ownership of durables, incl. PC
4	● Traditional hut/ shack ● Electricity, communal access to water, non-flush toilets ● TV sets, electric hotplates	9	● Urban dwelling ● Full access to services ● Full ownership of durables
5	● House ● Electricity, water on plot, flush toilet outside ● TV sets, stove, fridge, hi-fi	10	● Urban dwelling ● Full access to services ● Full ownership of durables

Source: South African Audience Research Foundation (2012).

Table A4: Real average prices for Eskom's residential customers (rand per kilowatt-hour sold)

Table 4: Real average prices for Eskom's residential customers (R/kWh sold)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Baseline scenario	0.57	0.57	0.57	0.63	0.70	0.70	0.78	0.82	0.83	0.83	0.87	0.89	0.92	0.96	1.00	1.04	1.09	1.10	1.11	1.12	1.13	1.14	1.15	1.16	1.17
High scenario	0.57	0.57	0.57	0.63	0.70	0.70	0.78	0.82	0.83	0.83	0.87	0.89	0.97	1.05	1.14	1.24	1.36	1.37	1.38	1.40	1.41	1.42	1.44	1.45	1.46

Source: Eskom (n.d., up to 2015) and authors' calculations.