DISCUSSION PAPER ON THE USE OF AN INCLINING BLOCK RATE TARIFFS STRUCTURE AS A TARGETING MECHANISM FOR THE PROVISION OF FREE BASIC ELECTRICITY

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This discussion paper represents the views of the author and not necessarily that of Eskom

1. Introduction

The provision of electricity is a vital tool for growth and prosperity, which includes addressing social issues such as electrification of the rural poor and alleviation of poverty through subsidies in electricity tariffs.

Various mechanisms have been put in place to facilitate the provision and the use of electricity, to as many South African's as possible through government funded interventions such as:

- The Integrated National Electrification Programme, which is aimed at the provision of electricity to households without current access and its main objective is the eradication of the backlog of non-electrified dwellings in previously disadvantaged areas.
- The Free Basic Electricity (FBE) programme, which is aimed at providing relief for the payment of basic services for poor electrified households and ensuring optimal socio-economic benefits from the National Electrification Programme.
- The government provides funding through the DPLG to local government for free basic electricity. This funding is applicable to municipal supplied electricity customers plus Eskom supplied customers for current-limited electricity supply of 10A.

Local Authorities have been made responsible for the provision of free basic services by national government and as such have been provided with the major portion of the funding through the DPLG to cover costs associated with the programme. In areas where Eskom is the supply authority, Eskom is an agent for the local authority for the provision of free basic electricity, i.e. the local authority is responsible for identifying the indigent and enters into a contract with Eskom to provide free basic electricity. Eskom then claims from the local authority a fixed c/kWh value (the national average claim tariff as determined by the NER) for the free allocation. The difference between the actual tariff and this national average value, plus implementation and capital is funded by government through other mechanisms such as a dividend forfeit. It can be assumed that when REDS are formed they will be required to claim for revenue loss due to the provision free basic electricity in the same manner.

One of the major challenges experienced in the roll-out of the FBE programme is the identification of the recipients for the free basic electricity allocation. In order to standardise the targeting of the intended recipients, a task team was set up under the auspices of the Department of Minerals and Energy (DME) to establish the policy and programme for implementing free basic electricity.

This task team identified the following key issues:

- The cost and administration burden of identifying the recipients was significant.
- That all the distributors involved – Eskom and local government had many different challenges in implementing this programme.
- There had to consistency in the application of the programme, to ensure that customers within the same political area received similar benefits, irrespective of supplier.

The working group basically agreed that a self targeted tariff was the most appropriate approach to take as it was the lowest cost option and required limited administration or intervention by the supplier. This entailed using either a current limited tariff or a tariff for customers that used less than 150 kWh per month.

The DME produced and gazetted an electricity basic services support tariff (EBSST) policy document in 2003. This document makes two major recommendations regarding the recipients of the free basic electricity allocation:

- Those households that either apply to their Service Providers for a 10A supply.

- Or those who apply to be charged a special non-current-limiting tariff that provides the free basic electricity allocation. The choice of method used for self-targeting is left to the Service Authorities and the respective Service Providers. In the document the targeting approach to be used is based on consumption levels of 150 kWh less.

Subsequent to the policy document and in order to further facilitate the provision of free basic electricity, a further criterion was added by the DME to the above – that free basic electricity could be targeted to Eskom's Homelight 20A (or smaller) customers and those consuming less than 150 kWh per month. Homelight 60A customers requiring free basic electricity would be required to downgrade 20A.

The DME has consequently amended the policy to now also allow 60A supplies to be provided with free basic electricity, provided that they have been identified as indigent in terms of the indigent policy and are included in the local authority's indigent register.

In summary there are three ways of targeting qualifiers for free basic electricity.

1. Using the supply limit as a targeting mechanism i.e. customers with lower supply sizes (20A or less) are more likely to be poor.
2. Using the consumption level of 150 kWh or less.
3. Using the indigent register.

In spite of the three options, there is still dissatisfaction within some local authorities that the above mechanisms are not appropriate or suited to the circumstances of the local authority.

This paper looks at the potential of using an inclining block rate tariff as the fourth targeting mechanism and what possible impact this would have on cost recovery.

2. Features of an inclining block tariff structure

An inclining block rate tariff structure consists of two (or more) blocks of units of consumption, with the first block being the cheapest and subsequent blocks of consumption becoming progressively more expensive. Water tariffs tend to have inclining block rate structures, but this structure is also used for electricity tariffs.

Throughout the world, inclining block rate electricity tariffs are typically used for two reasons. Either as a life line tariff where customers can self-select the tariff if it is cheaper than other tariffs, or as a DSM strategy which provides pricing signals to encourage customers to use less.

The following are common features of an inclining block rate structure;

2.1. PROS

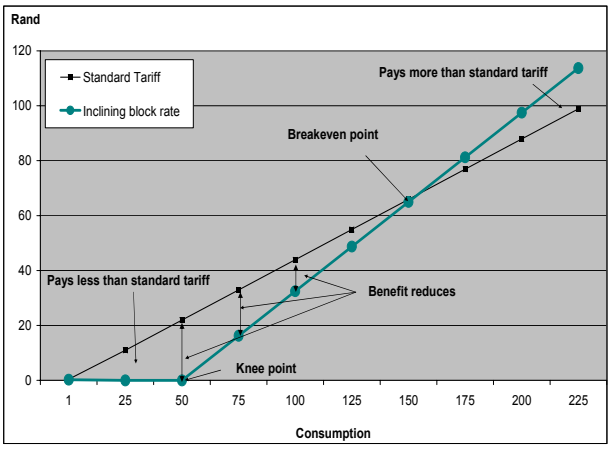
- Provides a basic amount of electricity at a very low price.
- Can be used as a self targeting mechanism i.e. customers self select if this tariff is cheaper than other tariff choices.
- Encourages energy conservation as it provides incentives to use within the free or lower block rate.
- For very low consumption customers may slightly stimulate electricity usage – savings for the first block of energy are not substituted but complimented with electricity usage.
- Is easy to administer.
- Is a good targeting mechanism as in South-Africa there is significant correlation between income and electricity usage (in areas where non-payment is not prevalent).
- There could be negative perceptions regarding the high energy rate.

2.2. CONS

- Not a cost reflective tariff structure – the average **cost** expressed in c/kWh reduces as consumption increases, while with the inclining block rate structure the average **charge** in c/kWh increases as consumption increases.
- Achieving an appropriate tariff level and structure without creating perverse pricing incentive may be complex.
- Does not benefit beyond the meter customers (Backyard dwellings).
- More affluent low users (such as holiday homes) could benefit.

The following graph compares the behaviour of an inclining block rate tariff against that of a single energy rate tariff.

Figure 1 – Comparing an inclining block rate tariff structure to a single energy rate structure.



It can be noted that:

- Above the knee-point, the average c/kWh charged become progressively more expensive, the benefit to the customer reduced as more electricity used
- An inclining block rate could limit or trap the consumer into using electricity at below the breakeven point.
- It becomes more complex to calculate subsidies as these will change with consumption level.
- If alternative tariffs are available, customers with higher average usage will convert to the other tariffs and therefore there will be no cross subsidisation benefit.

The provision of free basic electricity, with the first 50 kWh free, is already de facto an inclining block rate tariff, but the rate paid above the 50 kWh free, is at the standard tariff.

When referring to an inclining block rate in this paper, it is in the context of a tariff that has a higher energy rate than the standard tariff, only allowing 50 kWh free for customers that choose this more "expensive" energy rate above 50 kWh per month.

What is explored in this paper is the tariff structure, the value of the rate, the impact of the rate on the customers to be targeted and the impact of the tariff structure on the amount refunded by local government.

Eskom's tariffs are used as the reference standard tariff as Eskom currently is the only non local authority supplier of free basic electricity, and is refunded associated costs in part by local government. In future, when REDS are formed, this will be relevant as to how REDS are refunded for the amount of free basic electricity provided on behalf of local authorities.

3. Eskom current suite of residential tariffs

Eskom offers a number of different residential tariffs to its customers, but for the purposes of providing free basic electricity the suite of residential Homelight 1 tariffs are applicable and therefore will be used as the basis for comparison in this paper.

This suite of supply tariffs is in line with the DME approved and NER supported suite of supply options for electrification customers described as follows.

"A suite of capacity-differentiated tariffs with a range of connection fees and tariff structures will thus be offered to domestics customers. Lower-end tariffs will be structured to subsidise low levels of consumption but, as consumption increases, will automatically cover full supply costs and even contribute towards cross-subsidies. As consumption increases, households will have an incentive to shift to more sophisticated cost reflective higher-end tariffs.

Homelight is a subsidised single energy rate tariff suitable for low consumption supplies. The average consumption on this tariff is about between 80 and 90 kWh per month. This tariff is as follows:

Table 1 - Homelight 1 tariff

Tariff`	Rate	Connection fee
Homelight 2.5A*	39.08 c/kWh	RNil
Homelight 20A*	39.08 c/kWh	R 131.58
Homelight 60A	43.96 c/kWh	R877.19

Note that 2.5A and 20A has the same energy rate and therefore is combined when evaluating different rate options.

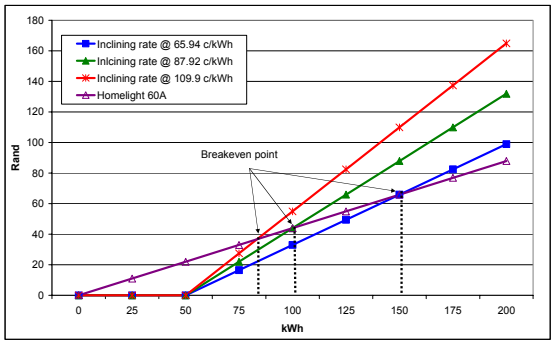
4. Options considered for the rate above the knee-point.

In Figure 1, the value of the rate above the knee-point has a number of important pricing issues:

- It impacts the breakeven point between the standard tariff and the inclining block rate.
- If the breakeven point is not correctly determined, it will impact the targeting approach of the tariff, too few or too many unintended customers may convert.
- The rate should not be so low as to encourage wastage of electricity.
- It should be cost based, but in a case such as this, it will not be referenced against true cost, but against the existing tariff.

The following figure shows examples of different rates compared to the standard tariff, and their respective breakeven points

Figure 2 – Different tariffs compared to the standard tariff



5. Determination of the rate to be used

The following table gives a high level summary of what pricing signals will be created at different rates and their different breakeven points.

Table 2 – Features of the breakeven point in the context of providing free basic electricity.

Tariff too high	Tariff too low	Optimal tariff
Many customers will see no benefits –	Many customers will benefit	The optimal number of customers will benefit
Customers will not convert	Many customers will convert	The customers targeted will convert
Not appropriate targeting - deserving customers will receive no benefit	Not appropriate targeting – will allow for unintended customers to benefit.	Appropriate targeting
Limits the benefits of providing electricity and the reason to provide free basic services.	Has the potential to encourage wastage	Has DSM potential
Potential for over-recovery	Potential for revenue loss	Benefits or losses kept to a minimum

The challenge is to determine the "optimal" breakeven consumption. This may not be as simple as first appears. For example, Eskom has national tariffs, but in different areas of South Africa the average consumption varies. What might be suitable in one area may be inappropriate in another area.

There is, however, a guideline that has already been set with regard to the breakeven point, namely 150 kWh. This consumption will be the value used to determine the rate above the knee-point.

The tariff is as follows:

Table 3 - Standard tariff and FBE inclining block rate

Tariff	Standard	Inclining block rate with first 50 kWh @ 0 c/kWh
Homelight 2.5 and 20A	39.08 c/kWh	58.62c/kWh
Homelight 60A	43.96 c/kWh	65.94 c/kWh

It must be noted that here is no breakeven between Eskom's standard tariffs and the current targeting mechanism as the rate is the same – the only difference being the free 50 kWh per month.

The inclining block rate above the knee-point, in this case is not cost-based, but rather is compared to the existing tariff to ensure that he correct pricing signals are provided so that customers receive the optimal benefit, the revenue risk is minimised and that subsidies are not increased.

There are therefore two factors that will influence the decision of the rate value. These are:

- The revenue impact.
- The targeting effectiveness – achieving the maximum benefit to the optimal number of customers.

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6. Calculation of the revenue impact

Unless all costs are recovered, there is a revenue impact caused by the implementation of free basic electricity. The size of this "revenue foregone" is reliant on the targeting mechanism chosen and the amount allowed to be claimed.

The revenue foregone (on an average c/kWh basis) is the difference between what would have been received on the tariff excluding the free basic electricity allocation and the national average allocation[1] allowed by government to be claimed. The shortfall must be funded through other mechanisms such as from the shareholder. For the purposes of this paper, only the revenue foregone as described above is used in determining the revenue impact and even though they are relevant, implementation and other costs are ignored.

6.1. Revenue impact at the standard tariff

The current amount allowed to be claimed by Eskom from local authorities is 35.36 c/kWh. This rate is determined by the NER on an annual basis.

The amount claimed from local government is as follows:

No of customers x 50 kWh x T_{FBE} *

***T_{FBE}** = National average claim tariff

The following simple formula is used to calculate the revenue foregone.

No of customers x 50 kWh x (T_{STD}# – T_{FBE})

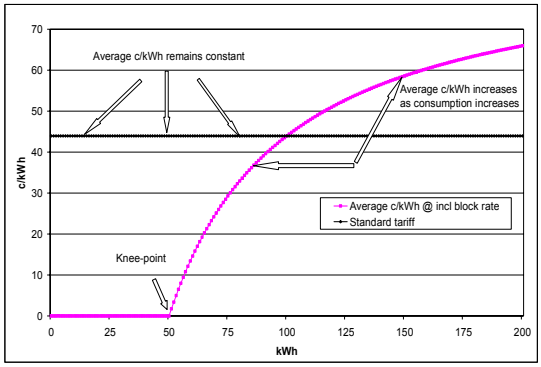
#T_{STD} = Standard tariff

If in the event the standard tariff is less than the national average claim tariff, then only the standard tariff is claimed i.e. there is no revenue foregone as the full amount can be claimed.

6.2. Revenue impact for FBE inclining block rate tariff

It is, however, not as simple to calculate the revenue foregone using an inclining block rate tariff. While for a single energy rate tariff the average c/kWh remains constant irrespective of the usage, for an inclining block rate tariff above the knee-point, the average c/kWh changes as consumption increases. This is demonstrated in the following figure.

Figure 3 – Average c/kWh at different consumption levels



The current revenue impact looks only at the national average claim rate and the amount of kWh provided for free. There are a number of different methods of determining the revenue foregone and the amount to be claimed, with differing revenue impacts. There are now three tariffs relevant in determining this impact.

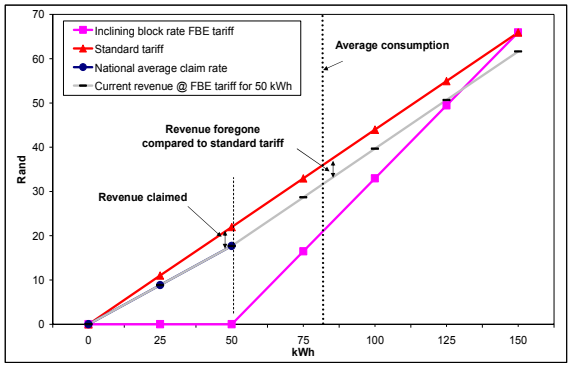
- What would have been received on the standard tariff

[1] As Eskom and local authorities have different tariffs structures and rates, a decision was made to ensure equity, that Eskom on a national basis will only be allowed to claim from local government up to this "national average" rate as determined by the NER from time to time.

- The revenue received by the customer on the FBE inclining block rate tariff.
- The national average claim rate for 50 kWh.

The benchmark against evaluating the revenue impact of any new methods is the current method of determining the revenue impact i.e. there should no significant difference in revenue or the amount claimed between methods either negative or positive. The following figure shows the current method.

Figure 4 – Revenue received on current method



The revenue foregone on the current method remains constant after 50 kWh on a R/customer basis. The challenge is to determine how this will be done with an inclining block rate tariff.

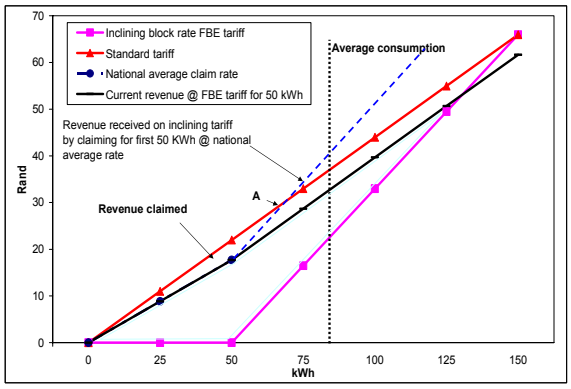
Three different methods are evaluated.

Method 1

As mentioned the average c/kWh is relevant for the inclining block rate at it changes at different consumption levels. The next figure shows:

- If the first 50 kWh is claimed at the national average claim rate, there is a potential for over-recovery at a lower point than the average consumption (point **A** on the graph).
- There is, however, limited difference between the impact on the revenue foregone using this approach and the current method.
- It is also unlikely that consumption levels will be significantly higher than the breakeven at point **A.** If consumption levels do increase, a review of the average rate would be appropriate.

Figure 5 – Revenue received using the national average claim rate for 50 kWh



As the amount of revenue below the breakeven point is always less than the current revenue (shown by the shaded area), it means that unless an appropriate method is devised, either the revenue foregone must increased or the revenue claimed from local government must increase. The above method avoids having to do this.

Method 2

Taking the average consumption into account, the following formula can be used to determine the revenue impact:

(Average consumption x T_{FBE}) – ((Average consumption – 50 kWh) x $T_{Incl\ BR}$#)

#$T_{Incl\ BR}$ = Inclining Block rate above 50 kWh rate.

To illustrate the potential impact at different average consumption levels are given in the following table.

Table 4 – R/customer revenue impact at different consumption levels.

Average consumption	**50**	**60**	**80**	**100**
Current revenue	22.0	26.4	35.2	44.0
Current Claim	17.7	17.7	17.7	17.7
Current Customer contribution	0.0	4.4	13.2	22.0
Current Shortfall	4.3	4.3	4.3	4.3
IB claim	17.7	14.6	8.5	2.4
IB Customer contribution	0.0	6.6	19.8	33.0
IB Shortfall	**4.3**	**5.2**	**6.9**	**8.6**

IB = Inclining block rate

It can be noted that the revenue impact per customer is more negative using the above formula, than the current shortfall.

Method 3
Another alternative would be to do away with the national average claim rate, and let the claim be made against the standard tariff rate. If this were allowed, it would mean an increase in the amount required from local government, because the standard tariff is higher than the national average claim rate.

The formula to be used is:

(Average consumption x T_{STD}) – ((Average consumption – 50 kWh) x $T_{Incl\ BR}$#)

 # $T_{STD\ BR}$ = The standard tariff rate

Table 5 – R/customer revenue impact using the actual tariff

Average consumption	**50**	**60**	**80**	**100**
Current revenue	22.0	26.4	35.2	44.0
Current Claim	22.0	22.0	22.0	22.0
Current Customer contribution	0.0	4.4	13.2	22.0
Current Shortfall	**0.0**	**0.0**	**0.0**	**0.0**
IB claim	22.0	19.8	15.4	11.0
IB Customer contribution	0.0	6.6	19.8	33.0
IB Shortfall	0.0	0.0	0.0	0.0

IB = Inclining block rate

The revenue shortfall reduces for the distributor, but the amount claimed from government is higher.

6.3. Targeting effectiveness

The current average consumption is important in assessing the revenue risk and the potential number of customers that could convert to the tariff.

Average monthly consumption can differ significantly throughout South Africa. In the Gauteng area the average consumption in Eskom is about 125 kWh per month, while in the poorer Eastern Cape region, the average consumption is below 50 kWh per month.

If the breakeven is set at the average of between 80 and 90 kWh per month, basically most customers in the Eastern Cape region would benefit on the inclining block rate tariff, while in the Gauteng region only a minority of customers use below the breakeven and would select the tariff.

However, this tariff may be one of a suite of targeting mechanisms used i.e. and other targeting mechanisms may be more appropriate i.e. in the Eastern Cape a more appropriate mechanism would be supply size limited tariff, instead of the FBE inclining block rate. This does not negate the fact that a tariff based a certain consumption level, will not necessarily be suitable in all areas within a distributor's supply area.

For example, if the breakeven is set at 150 kWh per month, most of Eskom's Homelight customers would benefit from this tariff. This is clearly not sustainable as it is almost a broad based approach and funding from government may not be adequate to supply all these customers. This needs to be balanced against the fact that this tariff would not be suitable for more urbanised poorer areas where the average consumption is much higher.

Another important factor is how to convert customers to the tariff. This could be done on application or through automatic conversions (through the billing/vending system). Automatic conversions, while possible, are more complicated with prepayment metered customers – especially where data is not correct or the system in not an online system. For conventionally metered supplies, automatic conversions are usually quite simple to do.

Where an automatic conversion cannot be done, it is important that customers are provided with enough information to make educated choices. Without adequate knowledge, many customers who would qualify for the tariff would not know to convert.

This communication to all customers within a local authority boundary is the accountability of the local authority as they are responsible to determine the recipients of free basic electricity. The distributor could act as an agent for any communication, as contacted by the local authority.

7. Conclusion

The following are important points to note regarding the implementation of a free basic electricity inclining block rate tariff:

- Calculation of the revenue shortfall is more complicated for an inclining block rate tariff, with the risk of either losing revenue or having a windfall benefit, depending on the method chosen to claim against using the national average tariff rate.
- The choice of claiming method would depend on the availability of funding.
- If the breakeven is set at 150 kWh which is the level of consumption as recommended by the DME as one of the targeting methods this could be effectively a broad-based approach in many areas of the country. The risk on the revenue foregone is may be higher depending on the method of claiming and the amount of customers targeted could increase i.e. increasing the impact of funding requirement from government.
- The targeting approach must be practical currently on a national basis and in future on a regional basis.
- A 20A and a 60A inclining block rate tariff would have to be developed, to be in line with the suite of supply options and to ensure that the breakeven between the standard comparative tariff and the inclining block rate tariff is kept at the target level.
- This tariff is not suitable for more urbanised poorer areas where the average consumption is much higher.
- Customers must be able to see the benefits or they will not convert. Unless a customer uses less than the breakeven there is no benefit.
- Above 50 kWh, the benefit of receiving 50 kWh starts to become eroded compared to the current method of providing free basic electricity.
- Customers would require adequate communication / education in order to be able to select such a tariff. The accountability for this communication needs to be clearly established.
- When REDS are formed, the local authority and the RED will be required to contract with each other as is currently the case between Eskom and local authorities. One RED could be required to contract for different free basic electricity options as required by each individual local authority. This has the potential to be administratively cumbersome, especially with regard to the flow of subsidies.

In conclusion, this tariff could be used as the first national tariff throughout South Africa (for both Eskom and municipal customers). This would facilitate the provision of free basic electricity and provide the first step in rationalising residential tariffs. In order to implement this national tariff, the development and approval at all levels would have to be directed by the NER and the revenue impact would have to be approved by the relevant government departments.