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## **Electricity theft and non-payment - Impact on the SA generation capacity crisis**

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**This article argues that the impact of electricity theft and non-payment in South Africa on the national electricity demand is about 3600 MW, which is equivalent to the output of a major coal-fired power station, or about 10% of the current national demand of around 36 000 MW.**

Therefore, it seems to me quite extraordinary and administratively unjust that paying customers and the productive sectors of the economy should be summarily cut off through "pre-emptive" load-shedding and forced load reductions, before reasonable efforts have been taken to cut off electricity supply to the thieves and non-payers first.

Yet, in the last six months of the generation capacity crisis, I have not heard a single public word or pronouncement by the powers that be in central and local government, NERSA, EDI Holdings, Eskom and the municipal electricity distributors, about the theft and non-payment problem. It is as though this problem simply does not exist.

It is clear that a high-level national action plan and campaign is required, involving the Treasury, DME, DPE, DPLG, NERSA, EDI Holdings, Eskom, SALGA, AMEU, all electricity distributors and SARPA (South African Revenue Protection Association), directed against electricity theft and non-payment.

The campaign should enjoy at least equal prominence, significance, importance and management commitment to the current DSM and energy efficiency programmes.

### **The scale of electricity theft and non-payment in South Africa**

Eskom's "non-technical losses" (read: electricity revenue lost as a result of theft, bypassing of meters, fraud, etc.) amounted to 5105 GWh for the financial year ending 31 March 2007, while arrear debt for this period (read: provision for unpaid electricity supplied and billed to customers operating a credit account with Eskom to be written off) amounted to some 1000 GWh [Ref. 1]. Eskom's total electricity losses due to theft and non-payment are thus 6105 GWh per annum.

As Eskom and municipal electricity distributors have similar numbers of residential customers (Eskom: 48.3%; municipal distributors: 51.7%), and also similar overall numbers of customers (Eskom: 47.2%; municipal distributors: 52.8%) [Ref. 2], it may be fair to assume that the scale of theft and non-payment in the municipal sector is similar to that of Eskom.

In proportion to their number of customers, electricity theft and non-payment for municipal distributors is thus estimated to be 6829 GWh per annum (Note 1), and the total national figure (i.e. Eskom plus municipal distributors) thus amounts to 12 934 GWh per annum (Note 2).

### **The impact of electricity theft and non-payment on the national demand**

The average annual demand corresponding to theft and non-payment of 12 934 GWh per annum is 1476 MW (Note 3). To obtain the corresponding peak demand, the average demand must be divided by the load factor, noting that, by definition, the load factor is the average demand divided by the peak demand.

There will of course be some debate on the appropriate load factor to be used, which depends on the mix of customer categories involved in the theft and non-payment, as well as the diversity of the resulting demand with the rest of the system. A load factor of 0,3 would be appropriate for rural residential loads, a load factor of 0,4 for urban residential loads, and a somewhat higher value for commercial and manufacturing loads.

Noting that some 95% of all Eskom and municipal electricity customers are in the residential sector [Ref. 2], a load factor of 0,4 has been assumed. This gives a peak demand of 3690 MW corresponding to the average demand of 1476 MW (Note 4).

This is equivalent to the output of a major coal-fired power station, or about 10% of the current national demand of about 36 000 MW.

## **The financial impact of electricity theft and non-payment**

Based on Eskom's average residential selling price of about R0,42 per kWh (Note 5) [Ref. 3], the impact of lost revenue of the electricity distribution industry due to theft and unpaid electricity of 12 934 GWh per annum is about R5,34-billion per annum. One could argue that a value lower than R0,42 per kWh should be used, but this does not materially change things, as indicated below.

A further financial impact is the capital cost of a new 3600 MW "six-pack" coal-fired power station, estimated at R50-billion, which would otherwise not be required. Again one can argue about whether this should be some kind of peaking plant, open or combined cycle gas turbine plant, or even nuclear power plant.

Finally there is the enormous cost of unserved energy to the productive economy resulting from pre-emptive load-shedding and involuntary load reductions caused by inadequate generation capacity due to electricity theft, noting also that if there was no loss of electricity to theft or non-payment, load shedding and load reductions would in fact not be required.

To establish the actual cost of unserved energy, first you will have to get Eskom to disclose the expected energy reduction (kWh) per annum that is being forced on mining, industrial, commercial, agricultural and traction customers throughout the country as a result of a generation capacity shortage of 3600 MW due to electricity theft. Then multiply this figure by R75 per kWh, this being the cost of unserved energy currently used in Eskom's Integrated Strategic Electricity Planning (ISEP) process. This will give you the cost impact of unserved energy on the productive economy per annum. Eskom knows all these figures, but good luck in trying to obtain them!

However, as an example, let us just say that the unserved energy to the mining, industrial, commercial, agricultural and traction sectors resulting from load-shedding and involuntary load reductions were to be only 25% of the electricity stolen per annum (i.e. 2700 GWh), then the economic impact to the productive sector of this unserved energy would be R200-billion per annum.

And we should also not forget the loss to the fiscus of the company and value added tax resulting from all of the above!

### **The bottom line**

The bottom line is that in the era of serious generation capacity shortages in which we find ourselves for the next ten years, the financial impact of electricity theft and non-payment is staggering, and gets to the very heart of the sustainability of the electricity distribution industry in South Africa.

### **The excuses**

Of course, I am expecting some nitpicking over the facts, assumptions and calculations presented, none of which, however, will change the stark reality and broad picture presented.

Similarly, there is going to be some wringing of hands and bleating about the general levels of poverty, the so-called culture of non-payment, and the lack of commitment and resources from the political leadership, government, police and justice departments in South Africa in routing out the thieves.

In fact, there will undoubtedly be all manner of excuses from those involved, as they try to deflect culpability and shift the blame from where it really belongs when there is such a clear business case - namely the executive management of Eskom and the municipal electricity distributors in South Africa.

### **A local benchmark**

Whilst electricity theft and non-payment is not restricted only to the residential sector, Eskom acknowledges that for its residential customer class, its non-technical losses (i.e. kWh stolen) amounts to 27% of the total electricity supplied (i.e. kWh sold plus kWh stolen) to this sector. This also means that in this sector, Eskom's electricity lost to theft amounts to 37% of electricity sales!

But what should we be expecting from a properly managed electricity distributor in respect of its levels of theft and non-payment?

As a local benchmark, we can look to Khayelitsha, a severely disadvantaged, poverty stricken and largely residential urban community within the Cape Town metropolitan area. Its electricity distributor, PN Energy Services (Pty) Ltd, was originally formed as a joint venture by Eskom, EDF (France) and East Midlands Electricity (UK) for the electrification of Khayelitsha and the management of the township's electricity distribution business, infrastructure, metering and revenue collection systems, and network maintenance. Since 2007, the company has been fully owned by Eskom.

With a business model somewhat unique in South Africa, and in what may be considered to be a most problematic environment, PN Energy Services' dedicated management has driven non-technical losses down to some 7% of total electricity delivered. This has been done through its own internal efforts with the support of the community served, and without any external or preferential support or funding from government and/or the law enforcement authorities. This notable achievement simply results from the business imperatives applicable to a relatively small, ring-fenced private company, coupled with clear management accountability, good community relations, and good business and revenue protection practices.

In the process, PN Energy Services has become the only electricity distributor amongst the six large Eskom and 150 municipal electricity distributors that has an ISO 9000 quality management system in place!

### **A proposed plan**

To deal with this enormous national problem, I propose a high-profile national campaign, with significant penalties and rewards (i.e. strong incentive based regulation), led by the Treasury and involving the DME, DPE, DPLG, NERSA, EDI Holdings, Eskom, SALGA, the AMEU and all municipal distributors, to reduce levels of electricity theft and non-payment dramatically over a period of five years. To this end, I propose that electricity distributors should set aside a budget totaling R20-billion, made up of R4-billion per annum for five years.

The campaign, led from the top and directed at the thieves, should enjoy at least an equal profile, significance, importance and management commitment to the current DSM and energy efficiency programmes that are directed at paying customers.

I believe that the positive outcomes of such a plan would come at a fraction of the cost and in a fraction of the time required to build equivalent new generation capacity, and like DSM and energy efficiency, would thus make a meaningful contribution to addressing the current generation capacity crisis in South Africa, while also ensuring the sustainability of the electricity distribution industry.

### **Conclusion**

Is the achievement of significantly reduced non-technical losses just a dream in South Africa, or is this a practical and achievable goal, given serious, high-level management commitment, adequate resources and sufficient budget over a period of five years?

The example of Khayelitsha and PN Energy Services clearly indicates that the goal is certainly achievable, and that electricity theft is in fact not caused by poverty, a culture of non-payment, or a weak commitment by government enforcement agencies, as is so often claimed.

On the contrary, I believe that that the scale of electricity theft and non-payment in South Africa has been caused by management complacency over many years since Eskom's low-cost mass electrification programme started in 1991.

To put it kindly, I believe it is fair to say that revenue protection by Eskom and municipal electricity distributors in South Africa is being applied in ways that are too "user-friendly" towards the electricity thieves! This is quite clearly a management problem, or shall we rather say, a problem of mismanagement.

## Notes

- (1) Municipal distributor losses p.a. =  $(52,8 / 47,2) \times 6105 = 6829$  GWh p.a.
- (2) Total Eskom and municipal distributor losses =  $6105 + 6829 = 12\,934$  GWh p.a.
- (3) Average demand p.a. =  $12\,934\,000 / (365 \times 24) = 1476$  MW
- (4) Peak demand = Average demand / load factor =  $1476 / 0,4 = 3690$  MW
- (5) Average price to residential sector = Rand sales p.a. / energy sold p.a. =  $4064 / 9736 = R0,417$  per kWh

## References

- [1] Eskom email response to questions by EE Publishers, dated 9 April 2008, <http://www.eepublishers.co.za/view.php?sid=12745>
- [2] NER Electricity Supply Statistics for South Africa 2004, page 23, Table 6.3, <http://www.nersa.org.za/NewsPublication.aspx>
- [3] Eskom 2007 Annual report, page 189, Table 4, <http://www.eskom.co.za/annreport07/annreport07/downloads.htm>