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Uncertainties within South Africa's goal of universal access to electricity by 2012

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Abstract
The South African President in 2004 stated the policy goal of universal access to electricity by 2012. This goal requires a significant adjustment of annual connection targets and electrification budgets, based on accurate knowledge of the number of electrified and non-electrified households in South Africa. Published data on the state of electrification, however, varies widely, with reported proportions of households electrified in 2005 varying from 57% to 80%. In addition, apparent discrepancies of tens of thousands of connections exist between annual new connection rates reported in different official publications. Different definitions of Universal Access further impact strategic planning. This paper explores these uncertainties in relation to South Africa's goal of Universal Access by 2012 by focusing on the availability and accuracy of South African electrification data, and the definitions, targets and electrification budgets associated with Universal Access.

Keywords: Universal access, electrification, connections, targets, uncertainty, households

1. Introduction

South Africa has made remarkable progress in widening access to electricity. Prior to 1990, less than a third of households[1] had access. A decade later that proportion had doubled. However, in recent years the programme has slowed, and it now seems unlikely that the targets set by government will be met.

The dominant planning assumption within South Africa's national electrification programme during the 1990s was that 80% of all households in South Africa would be electrified by 2012 (Marquard et al, 2007). This target was, however, revised in 2004 when President Thabo Mbeki, in his parliamentary State of the Nation Address, said '...with a strengthened local government working with our state enterprise, Eskom, we will, within the next eight years, ensure than each household has access to electricity' (Mbeki, 2004).

This Universal Access goal required a significant adjustment of the strategic plan for electrification put forward by the Department of Minerals and Energy (DME), which took over from the National Electricity Regulator (NER)[2] as coordinator of South Africa's electrification programme in 2002.

Accurate knowledge of the past and current state of electrification in South Africa is required to accurately adjust this strategic plan, especially in terms of the annual connection targets and electrification budgets. Published data on the state of electrification, however, varies widely depending on the source. In addition, apparent discrepancies in annual connection numbers exist in different publications by the DME after December 2003.

The definition of Universal Access further impacts strategic planning: Mbeki's 'each household' may be interpreted as 100% of 2012 households, or as 100% of households at the time when the policy was first proposed (2004). The latter definition appears to be used by the DME in its strategic plan, which in effect means that an estimated 3 million new households formed between 2004 and 2012 might still be without electricity once the

DME's 2012 Universal Access goal has been reached.

This paper explores how the availability and accuracy of South African electrification data, and the definitions, targets and electrification budgets affect the possibility of achieving the Government's goal of Universal Access by 2012.

2. Availability and accuracy of electrification data

State agencies are the main source of electrification data due to budget and access restrictions affecting individual researchers.

Since resources are allocated for data collection and analysis in terms of specific state policies, the evolution of policy goals has a major impact on the availability of electrification data.

For example, data on connection rates and proportions of households electrified is available, while data on other more complex phenomena such as disconnections, illegal and informal connections[3] (which are apparently widespread) is difficult to obtain, because no effort is made by state agencies to compile this information and place it in the public domain.

2.1 Sources of electrification data

Table 1 summarises the total number of new electricity connections made each year since 1990, based on various official data sources.

For most years from December 1995 until December 2003 the NER published the *Lighting Up South Africa* report (NER, 2003), which gave a mostly consistent and complete overview from 1991 to 2003 of the annual number of new connections, including the connections made by Eskom and Local Authorities, the number of urban, rural, off-grid, school and clinic connections, and the total annual capital expenditure and cost per connection. In most years up to 2004, the NER also published another source of electrification data in the *Electricity Supply Statistics* report (NER, 2004) which identified the number of domestic electricity customers in South Africa.

Since 31 December 2003 (when the last *Lighting Up South Africa* reporting period ends) the DME's annual reports were the primary public source of electrification data. The DME base the electrification data in these reports on data submitted to it on a monthly basis by Eskom, municipalities and non-grid service providers licensed to distribute electricity, in a format prescribed by the Division of Revenue Act (DoRA).

Eskom's annual reports also publish electrification data, but these relate only to connections made by Eskom and therefore do not reflect the state of electrification in South Africa as a whole.

A statistically derived indication of the proportion of households electrified is published in *Stats SA's* annual household surveys and national censuses, which report the number of households in South Africa that use electricity for lighting. As lighting is typically the most basic application of electricity in a household, statistics on its utilization are taken as an indication of the households electrified.

2.2 Inconsistencies in DME publications

Since 2003, DME publications have been the main public source of detailed electrification data, as noted above. However, a number of data inconsistencies are apparent, as discussed below.

2.2.1 Annual connections

The NER reported 278 762 connections for the January 2003 to December 2003 period (NER, 2003). The DME annual report for the period April 2003 to March 2004 shows 230 967 grid and off-grid connections for the year (DME, 2004), inconsistent with the DME's 2004 strategic report, which shows 258 000 total connections (see Table 1) for the same 03/04 financial year (DME, 2004b). Neither of the two DME reports supply information on the number of connections in the January to March quarter of either the 2003 or 2004 years, which might have explained the substantial difference between its data and that of the NER.

The DME's 04/05 annual report contains inconsistent connection data. The Minister's report states that the Integrated National Electrification Programme (INEP) delivered 232 287 total household connections (NER, 2005) while 217 287 total household connections are reported on page 26, which is the same number given as the total of municipal connections on page 27.

The cumulative total new connections since 1991 has to be estimated after December 2003 due to the above-mentioned difference between the reporting periods of the DME and the NER, the lack of information on what happened during the overlap of the two periods, and the inconsistency of the DME's published data. For the purpose of this paper, it is assumed that 64 500 new connections were made in total for the quarter January to March 2004, based on the DME's reported annual connections of 258 000 for the 03/04 financial year, as shown in Table 1.

Although it is clear from Figure 1 that connection numbers have been steadily decreasing since 2003, non-reporting of connections might play a role, especially in the decline of municipal connections (DME, 2004).

2.2.2 Capital expenditure and cost per connection

The annual total capital expenditure of the electrification programme and the associated costs per connection were clearly reported in the NER's *Lighting Up South Africa* reports, but these figures are less apparent in the DME's annual reports since 2003.

Table 1: Reported households connected by the South African electrification programme, with calculated cumulative total

	Eskom connections	*Local govt connections*	*Off-grid connections*	*Farm workers connected*	*Total household connections for period*	*Calculated cumulative household connections, including farm workers* and off-grid (calculated)
1 Jan 1990	—-	—-	—-	—-	—-	2 998 897[1]
Jan91 - Dec91	31 035	51 435	0	0	82 470	3 081 367
Jan92 - Dec92	145 522	74 335	0	12 689	232 555	3 313 922
Jan93 - Dec93	208 801	107 034	0	16 074	331 909	3 645 831
Jan94 - Dec94	254 385	164 635	0	16 838	435 858	4 081 689
Jan95 - Dec95	313 179	150 454	0	15 134	478 767	4 560 456
Jan96 - Dec96	307 047	137 534	0	9 414	453 995	5 014 451
Jan97 - Dec97	274 345	213 768	0	11 198	499 311	5 513 762
Jan98 - Dec98	280 977	136 074	0	10 375	427 426	5 941 188
Jan99 - Dec99	293 006	144 043	0	6 241	443 290	6 384 478
Jan00 - Dec00	250 801	139 780	0	6 438	397 019	6 781 497
Jan01 - Dec01	206 103	127 255	0	3 560	336 918	7 118 415
Jan02 - Dec02	209 056	124 961	1 736	2 819	338 572	7 456 987
Jan03 - Dec03	*173 094*	*88 149*	*15 156*	*2 363*	*278 762*	*7 735 749*
Apr03 - Mar04	—-	*56 799#*	*18 092#*	—-	*258 000 or*	*7 800 249* (Est. 230 967# [2]64 500 new connections 1 Jan to 31 Mar 2004)*
Jan04 - Mar05	219 885#	—-	—-	2 429#	—-	—-
Apr04 - Mar05	—-	217 287# [3]	6 146	—-	232 287 or	
217 287 # [4]	8 032,536*					
Apr05 - Mar06	135 903	—-	20 842	1 105	172 139	8 204 675*
Apr06 - Mar07	151 088	—-	—-	1 037	155 476[5]	8 360 151*

Notes

Notes
Italic text indicates overlapping periods.
* Based on estimates. # Not referred to elsewhere in this paper, to avoid confusion.
[1] Derived from NER, 2003. [2] (Mbeki, 2004). [3] (DME, 2005). [4] (DME, 2005). [5] Does not include numbers for March 2007

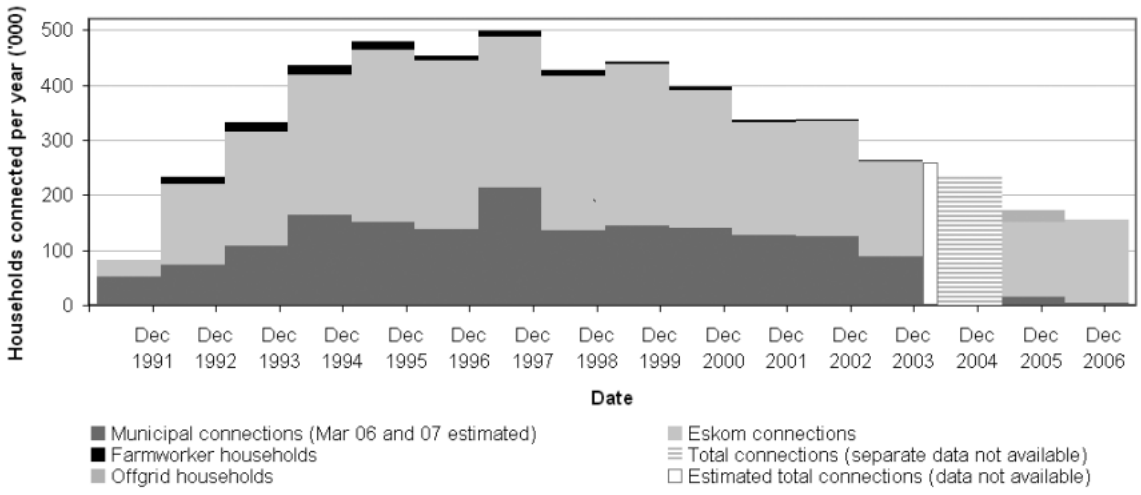

Figure 1: Annual new household electricity connections in South Africa (from Table 1)

These DME reports supply the total INEP expenditure, but are not specific about whether these amounts include or exclude bridging finance or reallocations towards bulk infrastructure.[4]

Given these uncertainties, this paper takes the yearly INEP capital expenditure to be R1260.007 million for 04/05 (including R271.901 million bridging finance for Independent Electoral Commission voting stations) (DME, 2005), R916.335 million for 05/06 (DME, 2006), and R897.235 million or R897.232 million (DME 2007) for 06/07, which seems to include R282 million towards bulk infrastructure (DME 2007).

The cost per connection can now be calculated, as shown in Table 2 and Figure 2.

Using only the nominal annual costs per connection data would make comparisons between years difficult, due to the difference in value between the Rand in, for example, 1991 and 2007. The Producer Price Index (PPI), published monthly by *Stats SA* and taken as 100 in 2000, is therefore used to adjust the nominal annual cost per connection relative to values in 2000, making relevant comparisons possible.

2.3 Total households in South Africa

Population growth and associated household growth are significant and little discussed aspects of the electrification programme.

The number of households in South Africa, shown in Figure 3, has been estimated each year by *Stats SA*, based on data extrapolated from two censuses, held in 1996 and 2001 (pre-1996 census data is problematic due in part to the exclusion of apartheid-defined 'independent territories' from South Africa).

Table 2: Electrification programme total capital expenditure and cost per connection.

	Total capital expenditure (Rmillion)	*Total new connections*	*Cost per connection*	*Average PPI (Stats SA)*	*Cost per connection after PPI*
Jan94 – Dec94	R1 488	435 858	R3 413	66.7	R5 117
Jan95 – Dec95	R1 412	478 767	R2 949	73	R4 040
Jan96 – Dec96	R1 473	453 995	R3 245	78.1	R4 155
Jan97 – Dec97	R1 176	499 311	R2 356	83.6	R2 818
Jan98 – Dec98	R1 235	427 426	R2 889	86.6	R3 336
Jan99 – Dec99	R1 186	443 290	R2 676	91.6	R2 921
Jan00 – Dec00	R1 011	397 019	R2 548	100	R2 548
Jan01 – Dec01	R909	336 918	R2 699	108.4	R2 490
Jan02 – Dec02	R899	338 572	R2 655	123.8	R2 145
Jan03 – Dec03	R931	278 762	R3 341	125.9	R2 654
Apr04 – Mar05	R1 260	232 287[1]	R5 424	127.4	R4 258
Apr05 – Mar06	R916	172 139	R5 323	134.3	R3 964
Apr06 – Mar07	R897	155 476[2]	R5 771	148.2	R3 894

Notes
1. Estimate – refer to Table 1. 2. Does not include numbers for March 2007

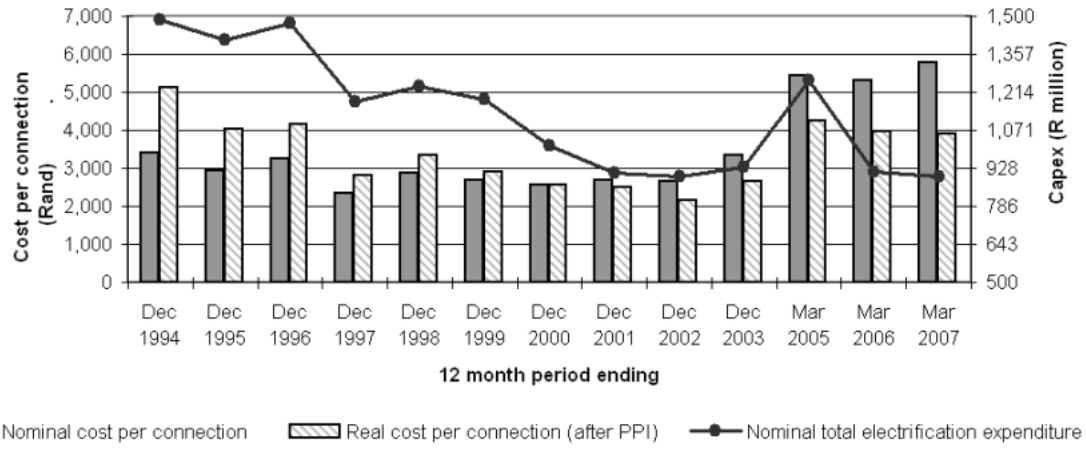

Figure 2: Average annual cost per connection and total electrification capital expenditure, from Table 2

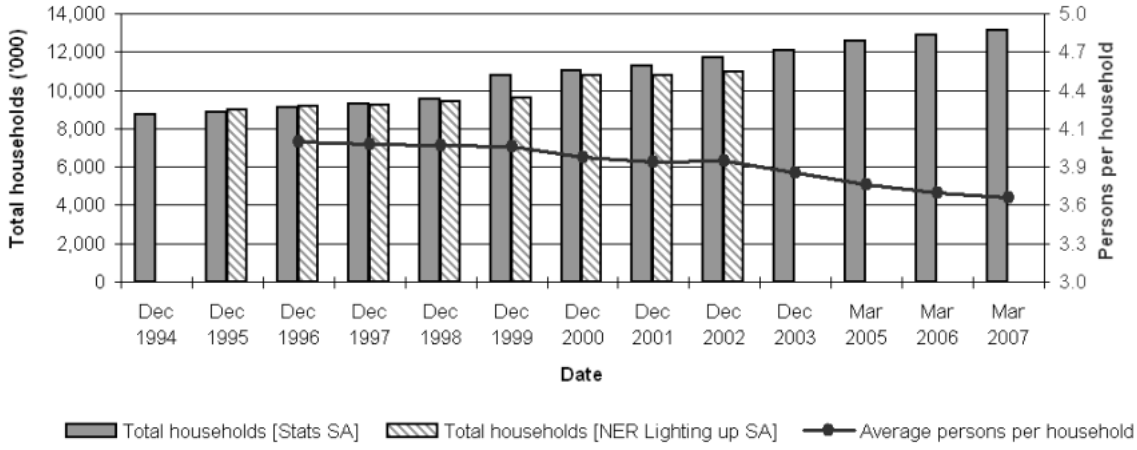

Figure 3: Total households in South Africa

As reported by Stats SA in October Household Surveys, General Household Surveys (GHS) and census publications, compared to data used in NER's Lighting Up SA reports. Persons per household obtained from (Stats SA, 2005) and the GHS (1997 and 1998 data extrapolated)

From Figure 3 it is clear that population growth and household growth are taking place at different rates, evident from the decline in average household size from around 4 people in 1996 to 3.8 in 2001. This decline is due to a number of factors that are still poorly understood, but which include housing programmes (the housing programme's website reports that 2.3 million houses have been built by the programme in the 10 years since 1997), urbanisation, a decline in fertility, and HIV/AIDS.

While household size has been declining, the population is estimated to have increased from around 40 million in 1994 to 47 million in 2006 (18%), with an increase in the number of households from around 8.6 million to around 13 million over the same period (48%).[5] This increase in the number of households has significant implications for the electrification backlog, as depicted in Figure 4. Whereas the electrification programme significantly outstripped household formation from 1995 to 1998 (and thus addressed the backlog), it has fallen behind annually since 2003.

Note that *Stats SA* appears to have adjusted the total households figure between 1998 and 1999, leading to the inconsistent values shown between these years in Figures 3 and 4.

2.4 Estimating the percentage of households electrified

The percentage of total South African households electrified is arguably the most useful electrification indicator and also the most politically significant. It is also subject to a large amount of uncertainty. The first systematic effort to estimate the degree of electrification was undertaken by Eskom and the NER from 1994 to 1995 as part of the NER's process of licensing local authorities.

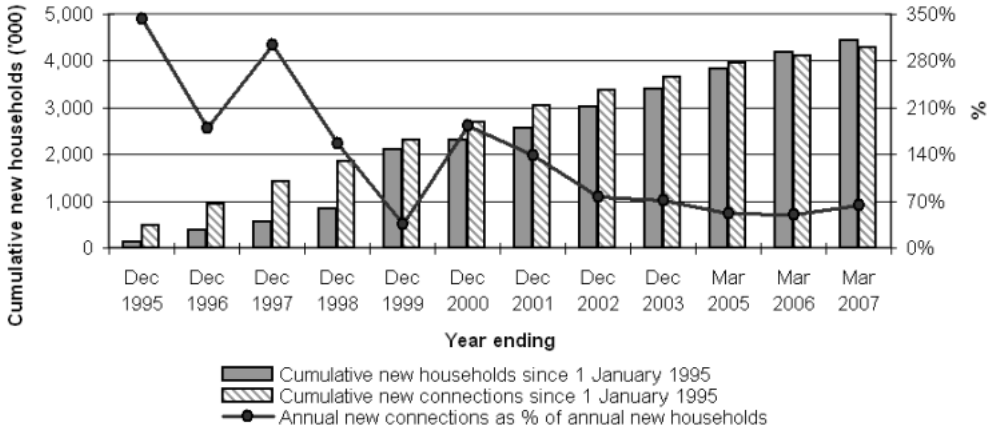

Figure 4: Cumulative new South African households versus cumulative new electricity connections since 1 January 1995. The annual new connections as a percentage of annual new households are also shown

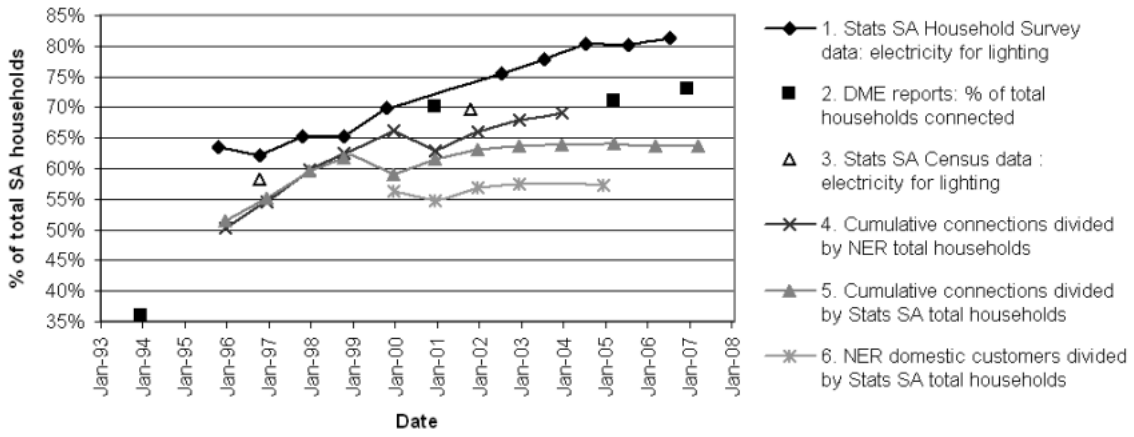

Figure 5: Different estimates, derived from published data, of the percentage of total South African households that are electrified

2.4.1 Regulator's model

The NER concluded that at the end of 1995 50.38% of households were electrified (NER, 1995), based on the number of domestic customers of all distribution utilities in the country.

The NER was designated as the official repository of electricity industry statistics and electrification statistics, between 1995 and the end of 2003. The proportion of households electrified was calculated using a simple model, which took the sum of the number of electrified households reported in the previous year and new connections made during the current year, and divided this total by the total number of households in the current year.

The disadvantages of this model were that it was dependent on the accuracy of the previous year's figure, and it did not take into account the 'de-electrification' of settlements or disconnections, which has not been quantified. Most of the new electricity connections to low-income households were undertaken with pre-payment meters. Thus, even if there have been relatively few physical disconnections, electricity may not be used when household budgets are under strain. Nor does it take into account illegal or informal connections, the quantity of which are unknown, but anecdotally reported to be relatively high.

2.4.2 Estimates from different sources

Whereas state agencies used the above method until around 2004, it was abandoned for current assessments: the DME uses estimates based on survey data from *Stats SA*, which are higher than other estimates, and Eskom uses a variety of methods including extrapolation from the 2001 census and geographical information systems-based methods.

The data depicted in Figure 5 illustrates the significant differences that exist between the different estimates of the percentage of total households electrified.

The first data set reflects the proportion of households that use electricity for lighting, based on data from *Stats SA*'s October Household Survey (OHS) (conducted from 1995 to 1999), the July General Household Survey (GHS) (from 2002 until the present) and the 1996 and 2001 October Censuses.

The Household Survey data appears to overestimate the amount of households that use electricity for lighting (data set 1) by around 4% when compared with the corresponding electricity for lighting data from the 1996 and 2001 censuses (data set 3). A reason for this overestimation might be that the Household Surveys sample, of only around 30 000 households, and may be partial to urban rather than remote rural households, compared to the census which attempts to cover all households.

The DME occasionally reports on the percentage of total households electrified, and these reports are shown as data set 2 from three sources (DME, 2001; DME 2005; & DME, 2006c).

The NER reported total connected households percentages in its *Lighting up South Africa* reports between 1996 and 2003 (data set 4), based on the cumulative connections divided by the total number of households. Since some, if not all of the NERs household figures are wrong, as shown earlier in Figure 3, a recalculation using Stats SA total households data shows a much lower percentage electrified (data set 5).

Finally, the NER published the total number of domestic electricity customers in its *Electricity Supply Statistics for South Africa* reports from 1999 to 2004. These figures, divided by *Stats SA* total households, are shown in Figure 5, data set 6.

3. Universal access: definitions, targets and budgets

3.1 Progress towards Universal Access

Figure 6 gives an overview of the current state of progress of the electrification programme towards Universal Access. The first and sixth data sets in this

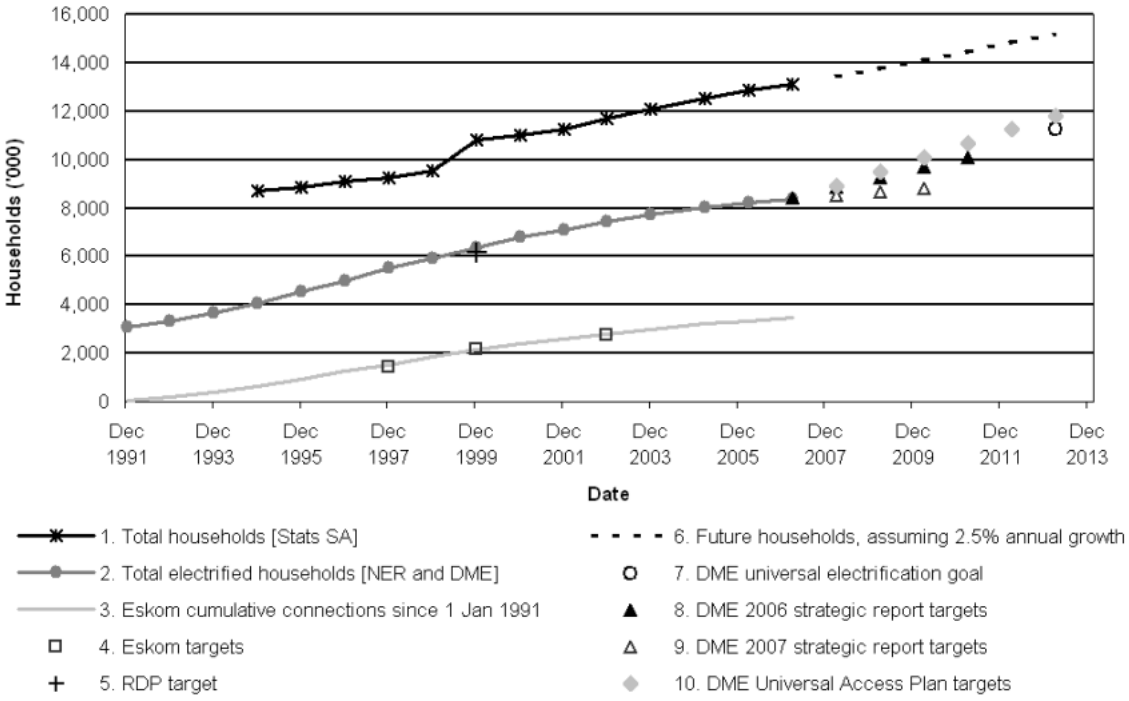

Figure 6: Total households versus total electricity connections, shown with Eskom cumulative connections since 1991 and Eskom, DME and RDP connection targets

figure indicate the total number of past, present and future households in South Africa as a baseline against which to measure the past and present number of cumulative households electrified (data set 2). It is evident that since 2006, the gap between the first and third data sets has been widening, representing an increasing electrification backlog, as was shown in Figure 4.

Also, up to 2002, Figure 6 illustrates that all the long-term connection targets set for the electrification programme were met. The first such target was set by Eskom in 1992, when it committed to bringing electricity to at least an additional 5 million people by 1997, which translates into 1.25 million households of 4 persons each.

Two years later, in 1994, Eskom undertook to electrify 1.75 million households by the year 2000 in terms of its Reconstruction and Development Plan (RDP) agreement, with municipalities responsible for 750 000 connections during the same period. Eskom reached its target in 1999 as indicated by comparing data set 3 (the cumulative connections made by Eskom since January 1991) with data set 4 (Eskom targets), and subsequently made and reached another commitment to electrify an additional 600 000 homes between 2000 and 2002. The municipalities significantly exceeded their target.

After the Universal Access goal was announced, the DME increased their strategic connection targets. While the targets for 06/07 were kept the same as in 05/06 (215 000 households and 1 050 schools and clinics), the targets for the years thereafter until March 2011 were increased to 415 000 households and 2 100 schools and clinics (DME, 2006b), represented by data set 8.

These targets fit into the DME's strategic vision 'to electrify 500 000 households annually (subject to the allocation of adequate funds) with effect from the 2007/8 financial year at an estimated cost of R2.5 billion per annum' (DME, 2006b).

However, from around 2004 the INEP started facing a number of challenges, the most important being inadequate sub-transmission (bulk) infrastructure in rural areas (DME, 2007b), resulting in the DME's targets being missed by a large margin, as shown in Table 3. In addition, only R1.4 billion was allocated for electrification in the 07/08 financial year, and the 07/08 connection targets were reduced from 415 000 to 150 000 households, with the emphasis placed on schools and clinics.

In the March 2007 strategic report the 08/09 and 09/10 targets for the INEP were also reduced, to 150 000 households per year (data set 9), even though Minister B P Sonjica states in the same report: 'The commitment to universal access to all our people by 2012 remains at the centre of our efforts …' (DME, 2007b).

Table 3: Recent strategic and budgeted targets vs. actual connections published by the DME

	Strategic targets (households : schools : clinics)	*Budgeted targets (households : schools : clinics)*	*Actual connections (households : schools : clinics)*
05/06	215 000 : 1 000 : 50	193 171 : 411 : 28	173 244 : 498 : 28
06/07	215 000 : 1 000 : 50	160 920 : 926 : 23	152 125 : 272 : 23

Table 4: Targets and budgets for the DME's Universal Access Plan *(Source: DME, 2007c)*

	Target: total connections per year	*Connections cost (R million)*	*Bulk infrastructure (R million)*	*Refurbishment / rehabilitation cost (R million)*	*Total per year (R million)*
07/08	569 422	3 417	1 025	512	4 954
08/09	571 854	3 485	1 045	584	5 115
09/10	574 334	3 555	1 066	666	5 287
10/11	576 864	3 626	1 088	759	5 473
11/12	579 444	3 698	1 109	866	5 673
12/13	582 076	3 772	1 132	987	5 891

3.2 Requirements for universal access

In terms of the cumulative connections versus the total households shown in Figure 6, it is clear that the current target of 150 000 household connections per year will not even start to address the electrification backlog, much less the Universal Access goal.

But what targets and budget are then required to reach Universal Access?

3.2.1 The DME's universal access plan

The DME attempts to answer this question in their Universal Access Plan (UAP), which is not available publicly, but is summarised in a presentation available on its website (DME, 2007c). The capital expenditure and connections required according to this plan are shown in Table 4.

While the DME's future estimated average cost per connection is around R6 500 (nominal March 2013) for planning purposes (DME, 2007c), excluding bulk infrastructure costs, Eskom officials estimate that nominal costs will rise to around R10 000 by 2013 (Marquard *et al,* 2007). The DME's nominal R6 500 is around R3 400 in 2000 Rands, roughly equal to current costs; Eskom's R10 000 is around R5 300 in 2000 Rands, 35% higher than current costs (assuming March 2013 PPI of 190%, or 6.9% p.a.).

These targets and projected expenditures are based on a total (i.e. including bulk infrastructure and refurbishment) connection cost of R8 700 per connection in 2008, increasing by around 3% per annum. It is clear from Table 4 that the projected expenditure requirement for the DME's UAP, at around R5 billion per year, is far in excess of the INEP grant of R1.4 billion for 2007/8.

In addition, data set 10 in Figure 6, which represents the DME's UAP targets, illustrates that the targets do not achieve universal access for all households in South Africa by March 2013, but only increase the estimated proportion of electrified households from 64% in 2007 (Figure 5, data set 5) to around 80% in 2013.

From the above, it is clear that the DME's definition of Universal Access does not take into account any growth in the total number of households in South Africa since the goal was announced in 2004. This is confirmed in their strategic report of 2004: 'The INEP has seen 4.06 million households … electrified since 1994. The program is set to continue for the next 8 years until the 3.5 million backlog of connections is eliminated.' (DME, 2004b). Data set 7 in Figure 6 shows the Universal Access goal implied by this statement.

3.2.2 100% of households electrified scenario

A number of assumptions need to be made in order to project the requirements for 100% access to electricity by all households by March 2013. These include that the household growth will continue at the current rate used by Stats SA of around 2.5% per year, and that the current amount of connections as reported by the DME is correct (that is, not actually lower due to disconnection or higher due to informal and illegal connections).

With these assumptions the difference between the current number of households connected and the total number of households by 2013 is around 6.9 million households. This translates into a connection target of roughly 1.15 million households per year until 2012, at an annual total expenditure of R10 billion, rising to R11.6 billion by 2013, assuming the same costs per connection as used in the DME's UAP.

An awareness of the inadequacy of the funding for electrification is not new. The Financial and

Fiscal Commission reported in 2002 that the budgetary allocations indicated that the connection targets at that time, between 250 000 and 300 000 per year, would not be met (DME, 2006c).

Targets and adequate funding are, however, not the only requirements to return annual connections to levels exceeding 250 000 per year; project management, technical skills and adequate supply of material like transformers are also crucial.

4. Observations

The following observations may be made from the above analysis:

- Significant gaps and discrepancies appeared in published annual connections data after 2003, when the DME took over responsibility for electrification data from the NER. Only a part of this uncertainty could be blamed on non-reporting by local authorities.
- In addition, total annual capital expenditure on electrification and the associated cost per connection was not clearly reported in most DME annual reports after 2003. This is due to lack of clarity in reporting of the impact of bridging finance and reallocations towards bulk infrastructure on total expenditure.
- The range of published percentages of total households electrified (57-80% in 2005) is significant. Different definitions of total households, along with disconnections and illegal and informal connections appear to play a significant role in the discrepancies between published data.
- It appears that no effort is made by state agencies to compile information on disconnections and illegal and informal connections and place it in the public domain. This information is, however, crucial for accurate calculation of the percentage of total households with access to electricity.
- Stats SA reports that the population growth and the steady decrease in the number of people per household since 1996 result in roughly 350 000 new South African households per year. Since 2003, this new household formation annually outstrips the electrification programme's connections and increases the electrification backlog.
- Even if an adequate budget was made available to the INEP, the DME's Universal Access Plan would only increase the estimated percentage of total households electrified from 64% in 2007 to roughly 80% in 2013 (if annual estimated household growth is taken into account). This percentage is still far short of the 100% envisioned.
- Due to budget constraints since 2005, the DME's revision of actual annual connection targets is well below the proposed strategic targets.
- Challenges like inadequate sub-transmission (bulk) infrastructure in rural areas will most likely result in a future increase in real cost-per-connection expenditure.
- In order to provide access to electricity to 100% of households in South Africa by 2012, more than one million new connections would be required per year at an annual expenditure exceeding R10 billion. Even if the budget is made available, it is unlikely that the management and technical capacity and equipment supplies currently existing in South Africa can support such high annual connections targets within the next few years.

5. Conclusions

Access to electricity by 100% of South Africa's households by 2012 is practically impossible at this stage, due to significant financial and capacity obstacles.

Although the Government has made a clear statement of policy preference for Universal Access by 2012/13, the funding available for electrification is significantly below the level required to meet even the DME's Universal Access Plan targets, which would result in roughly 80% access by 2012. Meeting even these targets requires strong political backing, hugely increased electrification budget allocations, and a dramatic step-up in terms of capacity.

In the light of this analysis, the Government needs to consider the political and social implications of not meeting the Universal Access goal by 2012, and should then reassess existing electrification targets, together with the efficiency of current electrification progress measurement and reporting systems. Ultimately, a more realistic and achievable set of planning targets will need to be developed.

Notes

1. Stats SA (2005) defines a household as 'a group of persons who live together, and provide themselves jointly with food and/or other essentials for living, or a single person who lives alone.'
2. The National Electricity Regulator (NER) was replaced by the National Energy Regulator of South Africa (NERSA) in November 2005 in terms of the National Energy Regulator Act of 2004.
3. Informal connections are extensions of electricity supply from one household to another by householders (thus the electricity is still metered), whereas illegal connections comprise connections to the distribution grid by householders that bypass metering systems.
4. While the electrification programme did not previously deal with the lack of bulk infrastructure (it was assumed that implementing authorities would bear the associated costs), the DME determined in 2004

that lack of bulk infrastructure was becoming a major obstacle to electrification, and began to fund the development of infrastructure in cases where at least 70% of the load could be attributed to newly-electrified houses, and have allocated between 10 and 15% of the annual electrification budget to bulk infrastructure projects.

5. The number of illegal immigrants from especially Zimbabwe, and consequently the real number of households in South Africa, is probably being underestimated by official demographics

References

DME 2001, *Annual Report 00/01*, Department of Minerals and Energy, Pretoria.

DME 2006c, *Digest of South African energy statistics*, Directorate: energy planning and development, Department of Minerals and Energy, Pretoria.

DME 2004, *Annual Report 03/04*, Department of Minerals and Energy, Pretoria.

DME 2004b, *Strategic Report 04/05 – 06/07*, Department of Minerals and Energy, Pretoria.

DME 2005, *Annual Report 04/05*, Department of Minerals and Energy, Pretoria.

DME 2007, *Annual Report 06/07*, Department of Minerals and Energy, Pretoria.

DME 2007b, *Strategic Report 07/08 – 09/10*, Department of Minerals and Energy, Pretoria.

DME 2007c, PowerPoint presentation by M P Masemola on the DME's universal access plan, www.dme.gov.za, DME, Pretoria.

DME 2006, *Annual Report 05/06*, Department of Minerals and Energy, Pretoria.

DME 2006b, *Strategic Report 06/07 – 10/11*, Department of Minerals and Energy, Pretoria.

Eskom 2003 to 2007, *Annual reports*, Megawatt Park, Johannesburg.

FFC 2002, Restructuring of the Electricity Distribution Industry. Fiscal and Finance Commission, Midrand.

Marquard, A, Bekker, B, Eberhard, A and Gaunt, CT2007, *South Africa's Electrification Programme: an overview and assessment*, University of Cape Town, www.gsb.uct.ac.za/mir.

Mbeki T 2004, Address of the President of South Africa, Thabo Mbeki, to the first joint sitting of the third democratic Parliament, Cape Town, 21 May 2004.

NER 1995, *Lighting Up South Africa 1995*, National Electricity Regulator, Pretoria.

NER 2003, *Lighting Up South Africa* 2003, NER, Pretoria.

NER 2005, Electricity Supply Statistics for South Africa 2005, NER, Pretoria

Stats SA 2005, Census 2001: achieving a better life for all – progress between Census 1996 and Census 2001, Statistics South Africa, Pretoria..