

Current-limited supplies of electricity in the context of South African rural areas

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CONTENTS

1. INTRODUCTION	1
2. LESSONS FROM 2.5A PILOT PROJECTS	2
2.1 The context	2
2.2 Energy use	2
2.3 Supply packages	3
2.4 Level of supply	3
2.4.1 20A households use no more than 2.5A	4
2.4.2 Households opt for 20A & 60A	4
2.4.3 The very poor are happy with only lighting and media	7
2.5 Controlling expenditure	8
2.6 Affordability	10
2.6.1 The impact of electricity on household energy budgets	14
2.7 Unstable, unreliable and infrequent rural incomes	16
2.8 Enjoying the benefits: the importance of information and education.	16
3. THE EFFECT OF ELECTRICITY ON RURAL ENERGY USE	17
3.1 Income categories used in this report	18
3.2 Energy services of the 2.5A supply	18
3.2.1 Candles and paraffin are still used for lighting	18
3.2.2 Irons and kettles	20
3.2.3 Radios and TVs are still run on batteries	20
3.2.4 Refrigeration and income generation	20
3.3 Cooking with electricity	21
3.4 What are the essential electricity needs of rural households?	22
4. ARE CURRENT-LIMITED SUPPLIES APPROPRIATE?	23
<i>References</i>	<i>27</i>

1. INTRODUCTION¹

*Rolls Royce systems are supplied to customers requiring bicycles.
(Barnard 1996)*

This analogy is often quoted by Eskom staff who face the difficult task of devising electrification policies, particularly in rural areas where costs are high and electricity consumption remains low. One of the proposed strategies is to implement current-limited supplies in rural areas, particularly those which are far from the electricity grid and have low settlement densities. Over the last two years, however, there has been considerable discussion on whether it is, in fact, appropriate to implement current-limited supplies in rural areas.

Clearly, the widespread implementation of current-limited supplies, especially as low as 2.5 Amperes, is attractive for Eskom. Davis (1996), in his financial modelling, suggests that capital cost savings of 33% can be achieved by supplying a range of capacity differentiated supplies. Cost savings are not the only benefit to Eskom: it is also believed that current-limited supplies will limit the effect of electrification customers on the national load profile. While the arguments for implementing current-limited supplies, and in particular 2.5A supplies, are important from the utility's perspective, it is notably more difficult to determine whether current-limited supplies will be affordable, appropriate and accepted by rural people.

This paper will attempt to provide insights into how appropriate and acceptable such supplies are for rural households, and for this reason deliberately presents a biased perspective. It does not seek to weigh up the costs and the benefits of current-limited supplies. Rather, it aims to examine the effect of electricity on rural energy use, as well as to assess the implications of these energy use trends for various electricity supply options to rural areas. To do this, the paper will draw on experience of the two 2.5A pilot projects, as well as knowledge and experience gleaned from energy use research in other rural areas.

Section 2 examines the lessons from the 2.5A pilot projects at Tambo and Mafefe, by examining whether the level of supply provides for the electricity service needs of rural households. Issues regarding the flat rate tariff are also discussed, particularly with regard to whether households are able to pay a flat rate tariff. Section 3 summarises the information available on the effect of electricity on rural energy use. Attention is given to understanding what the essential electricity needs of rural households are, particularly with regard to the role of electricity in cooking. Finally the paper presents a number of arguments, and further questions, which should be considered in the process of making decisions about the implementation of current-limited supplies of electricity.

¹ This paper has been written specifically to provide input into Eskom's decision-making process about implementing current-limited supplies, by providing insights drawn from research with rural communities.

2. LESSONS FROM 2.5A PILOT PROJECTS²

2.1 The context

It is important to reflect on the context of the pilot project sites of Tambo and Mafefe. The socio-economic conditions and opportunities, the energy consumption patterns, and the political conditions in each area have informed the extent to which 2.5A is suited to local conditions and accepted.

It is neither useful nor possible to make any judgements of the relative poverty of either location. Very poor people live at both Tambo and Mafefe. With both villages located in two of the poorest regions in South Africa, this is not surprising.

Households' livelihood strategies in both areas are characterised by a diversification of activities. State welfare grants, in the form of pensions and disability grants, are the predominant source of income. At Mafefe, disability pensions awarded to former asbestos mineworkers are a major source. A further commonality between the two localities is the dependence on part-time project work for income. Projects funded by the state or outside donors, such as Mvula Trust and Operation Hunger, provide important short-term, albeit unsustainable, income opportunities. Labour migrancy is still an important income-generating strategy for households in both localities.

While Tambo village may have better access to major roads and urban centres, it has severe water problems and infertile land. Thus, there is little reliance on agricultural activities for survival. Although clearly beneficial, it is important not to give disproportionate weight to Tambo's relative advantage of having access to major roads and urban centres. With its high levels of poverty, lack of income opportunities and basic resources, Tambo is much like other rural areas in South Africa. Mafefe, on the other hand, has relatively high rainfall, with fertile land in the valleys of the surrounding mountains. Subsistence agriculture is an important livelihood strategy at Mafefe, although there are distinct disparities and inequalities of access to the fertile land. Located at the base of the Wolkberg, Mafefe is far from urban centres, such as Pietersburg and approximately 40 km from a tar road.

One of the starkest differences between Tambo and Mafefe is the political context. A power struggle between democratic local government and tribal authorities has emerged at Mafefe. While conflict is inherent in any development process, it is clear that the struggle here has placed constraints on development. The situation at the newly established Tambo, on the other hand, is simpler. Although not devoid of conflict and power struggles, the absence of a tribal authority has led to a less troubled process towards infrastructural development. The Tambo village committee has managed to lobby a number of government departments, service providers and funders to gain access to services such as telephones, creche funding, a primary and high school, and water.

2.2 Energy use

Although findings from the pilot projects have been integrated into the discussion on rural energy use above, it is worthwhile emphasising the general differences in energy use between Mafefe and Tambo.

At Mafefe, the use of woodfuel is dominant for cooking and water-heating, as well as for ironing. For lighting, both candles and paraffin were mostly used, although there was a greater reliance on candles amongst poorer people. Dung was also used

² As the author of this paper also wrote a similar section in the post-electrification study of the Tambo village pilot project (James & Ntutela 1996), this section has drawn on that material.

for cooking by poorer people. There was also evidence of the use of gas and coal (Thom 1996).

At Tambo, on the other hand, paraffin was the dominant fuel used for cooking, heating water, lighting and ironing. The reliance of paraffin is largely due to the absence of an abundant supply of wood and dung – although both these fuels are used in addition to paraffin. In very poor households wood and dung are used exclusively, with little or no paraffin being used. Very little gas is used in the village (James 1996).

These energy use trends point to the possibility that people at Tambo spend more money on energy, especially for cooking, than those at Mafefe, where wood is freely available. It is unlikely that people at Mafefe will start to spend money on energy for cooking when they can have a free³ supply.

An interesting phenomenon has occurred at Mafefe. It seems that the biggest impact on energy use patterns at Mafefe has been on the use of paraffin. Prior to having access to electricity, some households used paraffin for lighting only and never for cooking. Since households were electrified paraffin has been used for cooking, especially when it rained, when wood was finished, or in the mornings to heat water quickly for tea. Rather than displace the use of paraffin, there seems to be a trend towards extending the end-use application of paraffin (Wentzel et al 1996). At Tambo, on the other hand, the use of electricity for cooking may well be facilitated by the fact that households are already spending money on paraffin for cooking.

2.3 Supply packages

In both pilot projects current-limited supplies were introduced together with other supply capacities, with each supply capacity having a different tariff and connection fee. The project design was not the same for Tambo and Mafefe.

At Tambo, households had to pay a R10 connection fee and a monthly flat-rate tariff of R15 for a 2.5A supply. For a 20A supply the connection fee was R200 and the standard homelight tariff of 26.84c/kWh with pre-payment meter was charged. A total of 497 households were electrified, with 131 opting for a 20A supply and 366 for a 2.5A supply of electricity.

For a 2.5A supply, households at Mafefe were charged a R10 connection fee and a monthly flat rate of R8.50 for the first six months and then R15 for the next two months. Due to the unpopularity of this price hike, the flat-rate tariff was dropped to R8.50 again after only two months at R15 per month. Conventional meters were provided with both the 20A and 60A supply and the connection fee was R300 and R450, respectively. A fixed monthly charge of R37.03, and an energy charge of 20c/kWh was charged for both 20A and 60A supplies (Wentzel 1997).

In the process of evaluating current-limited supplies it is important to examine the whole option: level of supply, tariff and connection fee, as issues which pertain to each of these aspects have emerged in the post-electrification research at Tambo and Mafefe.

2.4 Level of supply

This section aims to examine whether the level of supply provided with a 2.5A does provide for the electricity service needs of those at Tambo and Mafefe. The discussion will draw on the experience of households which subscribe to both the 2.5A and the larger supplies (20A and 60A).

³ Although this supply is 'free' in that no money is exchanged for it, it is important to understand the opportunity cost of women's labour time for fetching wood.

2.4.1 20A households use no more than 2.5A

The load research at Tambo village reveals that 56% of the households with 20A sampled (approximately 50% of the village) did not use more than 2.5A, with 70% not using more than 8A (Forlee 1996). It is tempting to use this data to argue for a particular limit on the level of supply. However, to do so would have the following shortcomings:

- there is little understanding of the appliances used in the household;
- there is little understanding of the factors which influence the electricity consumption in the different households;
- as the data analysed is for three weeks only, caution about generalising from the analysis is called for;
- the data provides a snapshot of consumption and does not allow for an understanding of changes which may occur over time;
- these results reflect the electricity consumption of households from one to four months after electrification, depending on which stage the households were electrified in.

2.4.2 Households opt for 20A & 60A

From a research perspective, it is fortunate that the pre-electrification negotiations at Tambo village led to a decrease in the connection fee for the 20A supply as this has provided useful data. Interviews with 20A household members revealed important information concerning the reasons for selecting a 20A supply above a 2.5A supply. For many households, these reasons lay with perceptions of, and problems expected with, the 2.5A supply option. While many 2.5A households share these attitudes, the circumstances in the households are such that they have not been able to afford, or prioritise expenditure on, a connection fee for a 20A supply of electricity.

In both pilot projects, households opted for the 20A (Tambo and Mafefe) and the 60A (Mafefe) supplies because they wanted to be able to use appliances, such as hotplates and stoves, which cannot operate with a 2.5A supply. In fact, the survey of 133 households conducted at Tambo revealed that 75% of the 20A households sampled chose this level of supply because they wanted to be able to use it for a range of electricity services not available with a 2.5A supply (James & Ntutela 1997).

The in-depth interviews at Tambo, and to a lesser extent at Mafefe, corroborated this finding and provided insight into the circumstances in households which had led to this choice. It is significant that not all these households fall into the high income category.

Household 1: Spaza owner

In order to secure a home for herself and her family Mrs I moved to Tambo. As her husband was a migrant worker in Johannesburg she stayed with her mother-in-law at Hewu. However, as they did not get on she decided to move back to her parents home at Mbekweni.

I left for my home in 1990 because my mother-in-law and I were always fighting. I stayed at home from 1990 till 1992. In 1991 I came here to Tambo alone to get land. My father was refusing to let me come to Tambo without my husband. I knew my husband would be home on leave in August in 1992 so I took my two children and went to my mother-in-law's house. My husband then came back home with us.

Mr I lost his job in Johannesburg in 1994 and moved to Tambo permanently. He gets work, for which he is paid R27 per day, on the various infrastructure projects in the village. At the time of the fieldwork he was part of a team building the school. He often worked for only one or two weeks in a month. For example, during the fieldwork he did not work for a week as they were waiting for the carpenters from Queenstown to finish their work. It is of great concern to them what will happen once the work at the school is finished.

It is very difficult for a man to work for a non-paying job because most men are used to working for money. And for a man to watch his family suffer because he is not able to

provide for them is not a pleasant feeling. Even the small spaza shop which I started is a help in making sure that the children do not go to bed without food.

Mrs I has a small spaza shop which sells groceries, such as sugar, washing powder, oil, tea, as well as paraffin. She makes about R60 a day, never less than R40 – although she cannot say how much of this is profit. It is difficult to separate out the spaza and household budgets as they are managed together. Her mark-up on items is very low and it is unlikely that even a quarter of this amount is profit.

They keep strong ties with Mrs I's family. Her father had just given them a sleeper couch. Mr I does not feel uncomfortable with this although if he could have it his own way he would provide for his family. He feels he will lose his dignity if he allows Mrs I's father to continue giving them too many things. Mr I has eight oxen and a few sheep which his mother looks after in Whittlesea. Mrs I does try to grow vegetables, although the lack of water is a problem.

Household 1, from Tambo, chose the 20 A from the outset because Mrs I wanted to use it for cooking. On the first fieldtrip to Tambo, she informed the research team that she was planning to buy a hotplate: 'I would like to be able to cook with electricity. It is only the way my husband works and gets paid which is discouraging.'

On the second fieldtrip, a month later, the hotplate had been acquired. Mrs I bought it with money which had been saved, and not on credit, as she resents the high interest rates associated with HP. It is interesting to note that Household 1 does not necessarily have a higher income than other households – in fact, it is variable and unreliable. With the use of the hotplate, the amount which was spent on electricity had increased from R5 to R10 per month. Although the hotplate is only used when cooking food which cooks quickly and the amount spent on electricity is only approximately equivalent to 37kWh of electricity a month, this service was clearly valued.

Household 2: Reliable migrant support, pension and savings

For Mrs J, Tambo village presented an opportunity to establish her own home with sufficient land. Although she had worked as a domestic worker in Cape Town for most of her adult life, it was difficult to return to her mother-in-laws' home in Dimbaza when she and her husband retired in 1994. They were allocated land in Tambo and began to build their permanent house in 1993. Both she and her husband received pensions.

Mrs J has four daughters, two of which live with her. She also looks after four grandchildren, one belonging to her daughter, a teacher in Tarkastad, and the others to a daughter living in Cape Town. Besides her daughters and grandchildren, a young man of 20 also lives with Mrs J. He used to do the gardening for Mrs J's daughter who is a teacher. During the holidays in 1995 he visited Tambo and has been with the household ever since. He attends school at Tambo.

In 1995 Mrs J's husband died. His death resulted in difficulties, as the household was accustomed to two pensions. However, Mrs J's children played a major role in ensuring that the household had sufficient resources to survive and enjoy a standard of living above the majority of households at Tambo. It is difficult now as she was earning a pension for two years when he died.

We used his money for groceries. It's good that the government pays us pensions, although others complain and feel that they can get more money. Old people must realise that their children have their own problems and cannot afford to support us. All my daughters have been very supportive and have bought furniture, especially the unmarried girl who is a teacher. It is important to have many children as some of them may help in the future.

Her daughter in Cape Town sends her R300 most months as a contribution to looking after her three children, whilst the daughter who is a teacher comes home on weekends with groceries. Her son has to date only ever given Mrs J R100, although he has promised to send more money to assist with paying of the outstanding debt on the building materials.

Mrs J has a modern brick seven-roomed house which was built over three years and is not totally finished. It is noticeably bigger and more elaborate than other houses at Tambo. Although Mrs J could not say how much she has spent to date, she has paid the builder R2700 for the current extension – three bedrooms, toilet and bathroom. A further R1800 for roofing material plus R1700 for building material is still owed to the suppliers in Queenstown. She has bought the material on credit and is paying this off in monthly instalments although she has not been

able to pay the last few months' instalments.

Mrs J also belongs to a savings club, which gives her both access to savings on a yearly basis, and enables borrowing of money, albeit at a high interest of 30%.

Household 2 at Tambo, which survives on one pension and contributions from migrants, has a stove which is used to cook foods which require a short cooking time as well as for baking. Exposure to electricity in urban areas has resulted in the acquisition of a stove being prioritised – for instance, the daughter (23) dislikes using paraffin and wood because she has spent her life in Cape Town where she had access to electricity. Access to savings put away during her years of employment has enabled her put a deposit down for the hire-purchase of the stove.

Stoves, however, are not prioritised by all households. Hotplates are more commonly purchased and stated as priorities. Even in one of the households at Tambo, where income levels are much greater than the average, only hotplates are used.

Household 3: Extended use: high income

Mr and Mrs W live in one of the larger, more 'luxurious' homes at Tambo. As well as their six children and one grandchild, they support two of their relatives' children. Mr W's mother also lives with them. One daughter (14) has had a child and another (17) has run away to her aunt because she is pregnant and her father was pressuring her to take him to the father-to-be.

I worry a lot about my children. They have disappointed me already, at a very young age I am a grandmother and will be again very soon. This kills me inside. All I wanted was for my children to get a good education because it opens doors to a better life. I can only hope that the others won't make the same mistakes. I do not care what they do, I will not discourage my girls from pursuing a career in agriculture for instance, although it is known to be a boy's career - they must do what they feel comfortable with.

Mrs W is actively involved in a number of community projects and political organisations. She is one of those who work at the brick-making project as volunteers in the hope that they will make some money eventually. She sometimes regrets the move to Tambo as she feels she used to do well in Mbekweni where she sold cold drinks and chicken pieces. However, she feels that the spaza shops at Tambo charge too little and that it would not be worth her while to set up a shop, even though she has both a fridge and a freezer. Mr W works as a carpenter in Dongwe. He earns approximately R2500 per month. However, he has monthly payments of R900 to make on a new bakkie. Other monthly credit expenses include clothing and linen store accounts and insurance policy payments (R300). In order to supplement his income for this he runs a taxi from Tambo to Queenstown, Whittlesea, Sada and Dongwe. He runs this taxi after work and during the weekend and usually earns sufficient income to cover the cost of his car repayments and maintenance. They have three cattle, two of them cows, five goats and twelve sheep. All of the nine chickens they had died a few months before the research. Mrs W does grow vegetables in her garden when there is sufficient rain.

Mrs W uses electricity for lighting, television, two hotplates (she has two others but they are broken) and two fridges. Prior to electrification the household used a generator to run the television. They also have a large gas freezer which is not in use as there is no longer a need for it. R50 electricity cards are bought and usually last for one month if the hotplates are used. Although both hotplates are used for cooking there are still some forms of cooking for which wood (baking) and paraffin (slow cooking foods, such as samp and beans) are used.

Despite the higher income of this household, electricity has not totally displaced other fuels for cooking. Although this is partly due to the expenditure demands in the household, such as the car repayments, the specific cooking requirements in the household have also led to multiple fuel use.

There are a number of households which have selected higher levels of supply because they wish to use electricity for thermal applications, but they do not have the means to do so yet.

HOUSEHOLD 4: Making provision for the future

Mrs K (43) from Mafefe is married to a migrant working in Johannesburg. She supports three of her children and two of her grandchildren whose mother is in Pretoria attempting to find work.

Her husband sends back R500 per month. In addition, they grow some fruit and vegetables in their yard (they have no other land). Any surplus produce is sold. At times she has been able to use other people's land if they are not using it. She managed to borrow a plot from someone in 1995 and produced four 80kg bags of mabela, two bags of green mealies and two bags of white mealies.

She gets her groceries on credit. She pays off her debt – usually R200-R300 – on a monthly basis. Although she prefers traditional food from her garden, she also buys canned food at times, especially during the drought where it is not possible to grow anything. If there is any money left she buys other things, such as building materials. She decides what to buy with the money her husband sends her but when it comes to buying expensive things that need hire-purchase agreements she consults with her husband. He has also never bought anything on hire-purchase without consulting her first. He normally buys things in Johannesburg.

Household 4 from Mafefe had also selected the 60A because Mrs K 'wants appliances in the future' (Wentzel 1997: 38). Considering that she relies on remittances to support herself and her household, this choice does seem surprising. She could clearly achieve the same service – that is, the use of electricity for lighting and ironing – with a 2.5A supply. However, she is happy that she has selected this level of supply because of the potential for acquiring other appliances.

The implication of this, however, is that this household is paying between R45 and R50 per month for lighting her five-roomed homestead and for ironing. Considering that the basic charge is R37.03 a month, the amount of electricity being used is small. With conventional metering, poor households which wish to make provision for future extended use of electricity, are paying a disproportionate amount of their income on services which do not consume a large amount of electricity, such as lighting. The impact of this on household energy budgets is significant, as money is still being spent on other energy service needs. It would be much more appropriate to provide higher levels of supply (20A and 60A) with a pre-payment meter, albeit at a higher kW/h tariff, as households do not pay for the operational costs associated with billing.

Due to the difference in the connection fee at Tambo and Mafefe, this does not seem to be as significant a trend at Mafefe as it is in Tambo. Clearly, more households could afford to prioritise and pay R200 at Tambo than R450 at Mafefe. However, there are a significant number of 2.5A households at Tambo which are unhappy with the 2.5A because they feel that they have been forced to opt for the 2.5A supply as they could not afford to pay R200. Similarly, people at Mafefe suggested that they had little real choice about which supply option to choose: 'if you could not afford the connection fee of conventional electricity you were given the limited supply' (Wentzel et al 1997: 41). Poor households have no choice.

2.4.3 The very poor are happy with only lighting and media

Many of the women (2.5A) interviewed at Tambo felt that the connection fee for the 20A militated against them being able to think about saving for or purchasing thermal appliances. Although they were aware that it was possible to upgrade they felt that the poor were being penalised at Tambo, if one compared the connection fees with those in other villages and urban areas:

Later you will find that people can afford to buy appliances but they must start afresh and get the 20A. If I had been Eskom I would have given something to people which served them better for longer.

There were, however, a number of people interviewed in the in-depth sample at Tambo and Mafefe who were happy with the level of supply. In fact, electricity represented a substantial improvement to the quality of life for many of the

households interviewed, even when it was only used for lighting and media. These households expressed no desire to have access to a higher level of supply. Take the following examples:

- Mr T (Household 7), a pensioner who lives alone with his school going children, is resolute about never acquiring appliances. As long as he is the chief breadwinner and decision maker in the household it is unlikely that this will change.
- Households 10, 11 and 12 will probable never prioritise expenditure on appliances due to their extremely impoverished circumstances.

It is very difficult to determine exactly which households, and under what circumstance, will need or/and be able to afford to use electricity for anything more than lighting and media. However, it is also not likely that circumstances or priorities within these very poor households will shift in the short term. This opinion was expressed by a number of households interviewed at Tambo. It is not conceivable, therefore, that a larger electricity supply will be needed by the very poor households at Tambo and Mafefe. The provision of electricity for lighting and media only is, thus, appropriate.

Although there is contentment about what electricity service needs are possible with the 2.5A, the flat rate tariff of the 2.5A supply was the cause of much concern for households at both Tambo and Mafefe. The following sections will deal with this issue in more detail.

2.5 Controlling expenditure

An important reason for households selecting the 20A supply at Tambo was that they could control their monthly expenditure on electricity. Nineteen percent of the 20A households included in the quantitative sample at Tambo selected this level of supply because they wanted a pre-payment meter which gave them control over their expenditure.

Mrs A described what had led her to opt for the 20A supply. Initially she was concerned that the energy services available with the 2.5A were limited.

The *umlungu* from Eskom came around a second time and explained to people how the 2.5A supply works, all the things it wouldn't be able to do. So people started worrying that they would not be using the iron, the heater, hotplate. So I thought that it was useless: I would like to be able to boil water quickly in the morning.

However, Mrs A paid R10 for a 2.5A connection. Not being entirely happy with her choice she asked for advice from people outside of Tambo who had experience of electricity.

I was advised by two men to upgrade to the 20A – with this I would not have to pay monthly. I had paid the R10, and so I paid the balance.

Thus, whilst the factors concerning both the limited services available, as well as the payment of this service were considerations, it was clearly the latter which was the overriding factor informing Mrs A's choice. The pre-payment meter allowed for flexibility and control over expenditure.

Household 5: Pensioner and female headed household

As with many people at Tambo village, 61 year old Mrs A's life has been shaped by apartheid land policies: forced removals, land allocation procedures based on allegiances to certain chiefs, and overcrowding. Tambo presented an opportunity for Mrs A to gain access to land and improve her life:

One day we were travelling by bus and saw people from Dongwe and Sada toyi-toying. On enquiring we were told that people were demanding land. They demanded that the Boers who were occupying land owned by Sebe should be chased away. There was too much overcrowding at Zweledinga and there at Tambo they were giving away 50 by 50 land.

Abandoned by her migrant husband some ten years prior to her settling in Tambo, Mrs A set about building a house for herself, four of her eight children and two of her grandchildren. It took three years and much effort to build the five-roomed house. Due to the water shortages in the village, the process of making bricks often required trips to the windmill at three in the morning to collect water. She also built a house for her pensioner mother.

During this time, the household survived on Mrs A's income from informal selling activities and a contribution from her mother's pension 'which was very helpful as it would keep us going for some time'. An important, but infrequent, source of support was the money and furniture sent by her two migrant children in Johannesburg and the two in Cape Town. That she struggled to ensure that her household survived is evident:

I used to borrow money from people, go to Queenstown slagpan and buy binnegoed and then sell to other people, some refusing to pay me and others would beat me up when I demanded payment. It was very difficult, but we survived. That was how we made a living in those days.

The transient nature of rural household livelihoods reveals how survival mechanisms have shifted since Mrs A first moved to Tambo. Her mother passed away a year ago. Notwithstanding other effects which her death may have had on household members, it is fortunate that Mrs A had started to receive a pension shortly before her mother died or the effect of the loss of her mother's pension on the household would have been much greater. Two of her children, living in Cape Town, have ceased to send any money or have any contact with Mrs A, although she is looking after two of her grandchildren. Her eldest son of 38 years, who had worked in Johannesburg, had an accident and is now living at Tambo. He is mostly unemployed, except for the piece-work he gets on community infrastructure projects, such as the construction of the school. The girlfriend of one of her other sons has also moved into the house, living with him in the outside room. This places stress on household resources as neither the son nor his girlfriend contribute to the household.

I do not like this but am worried that I will get into trouble with my son if I complain. What irritates me the most is that I must feed this girl and yet my son does not earn money. When I brought this up at the big meeting I was attacked by the men who asked why I had allowed such a thing to happen and that I must simply chase them away. This worries and disturbs me. I cannot make a decision and I don't know what to do.

A further concern for Mrs A is that her eighteen year old daughter, one of the twins, is mentally ill. Her daughter assists her with some of the domestic work, such as fetching wood, water and dung. Mrs A feels that it would be better if her daughter could go to a school where they deal specifically with mentally ill people. Her daughter in Johannesburg continues to support Mrs A by giving money and buying furniture.

Mrs A has also turned most of her plot over to vegetable gardening. However, due to the erratic and low rainfall in the region, the garden is not a reliable source of food. When the garden does yield a harvest, the crop is not sold but consumed by the household. Mrs A also owns two pigs.

I love ploughing and planting vegetables, but it is difficult with the water problems we have. This year we have not planted because there is no rain. Last year I ploughed and we had tomatoes, cabbages and mealies.

Mr and Mrs B's also decided to select the 20A supply once they understood that they would have to pay a fixed monthly rate.

We had put down money for the 2.5 but we thought about it as we were told that we had to rent R15. Because we know by the next quarter we have normally run out of money. So we realised we would not be able to pay the R15 sometimes, so we paid the difference and got the 20A. At least we could buy a card for R10.

Household 6: Double pension and migrant support

Mr and Mrs B are pensioners who were born in the Hewu district and started their married life in Thandagate. Caught in tensions around land when the Hershel people were relocated to the Ciskei, they left this area when people's houses were being burnt down. They moved to Sada where houses were scarce and when the opportunity of obtaining land at Tambo became possible they moved to Tambo in 1994.

Their two-roomed house took three years to complete.

We started from scratch. It took a long time to build this house. We used to borrow money. We still want to extend it as we feel that it is small. We must have a kitchen as we now cook in the sitting room and some of the children sleep here. We only have one bedroom so we must share the space.

Although Mr and Mrs B look after eight of their grandchildren they do not receive reliable remittances from the parents of the children.

I am very worried about him [their 36 year old son], it is about ten years now that he has not been home. We cannot tell whether he is alive. Especially with all these things going on in Johannesburg – the crime, the accidents. He just sent his young child. He just met someone that he knows and gave the child to him. We are now looking after the child at Tambo. We don't know where our son is. He does not phone.

Their one daughter, who has four children who live with their grandparents, is the only parent who sends money. However, she does not earn much and does not send money very often. She brought her parents a TV and a hi-fi on one of her annual visits to Tambo. Although they have planted vegetables in the past, the lack of rain during 1996 has not enabled them to plant this year. Thus, this large household of ten members survives predominantly on the two pensions which together bring in R820 per month.

Both Mr and Mrs B are involved in volunteer project work with the hope that they will eventually earn money. Mrs B is part of a group of women who run and work on the brickmaking project started by Operation Hunger. Mr B is the only man in the whole of the village who works on a voluntary basis – on the fencing project. To date neither of them have made any money from the projects.

At both Mafefe and Tambo, the desire to have pre-payment meters is overwhelming. Not one person interviewed in either location was happy to pay a flat-rate tariff, and everyone mentioned their preference for a pre-payment meter. At Tambo, it is evident that some people were aware that they are paying more on a monthly basis for their electricity than those with a 20A supply. Similarly, this was raised at Mafefe where people were aware of other villages and people in urban areas with pre-payment meters.

2.6 Affordability

This section will discuss whether a flat-rate tariff is affordable for rural households. The situations at both Tambo and Mafefe will be examined. Useful insights have emerged from both these studies, especially with regard to different tariffs being charged in the two localities. At Tambo, where a R15 monthly tariff was levied, a high percentage of houses (almost 72% at the beginning of October 1996) were cut off due to non-payment. At Mafefe, on the other hand, where a R8.50 monthly tariff was charged very few households were disconnected – however, when the tariff was raised to R15 there were more disconnections.

Most energy studies link affordability with household income, suggesting that the major factor which determines energy use is the size of the household income. The results from the Tambo research show that such an analysis is hopelessly over-simple and inadequate. It was found that, while income is clearly important, there are other factors which determine whether people can afford to pay the monthly flat-rate tariff. Take the case of Mr T in Household 7, whose pension supports him, four children and a baby. Mr T is by no means better off than other pensioners. In fact, besides borrowing from neighbours and having the use of credit from the local spaza, the household relies solely on his pension for survival and has no other livelihood strategies.

Mr T has absolutely no desire to acquire appliances. This is largely informed by the power relations, shaped by gender and age, within the household, where his daughters are responsible for the domestic work and have little control over decisions made in the household. It is significant that there is no senior woman in the household who is able to influence decisions. The gender division of labour means that Mr T is not responsible for the reproductive work, such as cooking, and it is therefore unlikely that he would ever prioritise expenditure on any appliance useful for such work. Furthermore, his antipathy towards television as an instrument of moral decay and social degeneration has informed his decision not to acquire one. Mr T only makes use of electricity for lighting one room in his two-roomed house. Although he has a radio it does not have an electric connection and he still pays R8 per month for a battery.

Household 7: Male-headed household

Mr T is a sixty five year old pensioner who lives with four children: two girls aged 18 and 15, an 11 year old boy and a 15 month old grandchild. His 21 year old daughter, the mother of this baby, had disappeared five weeks before the fieldwork for the research. She was in Std 9 when she fell pregnant. He pays R40 per month to the woman who looks after his grandchild.

His wife died of cancer in 1994. They moved to Tambo in 1991 from Sada because his wife had been accused of witchcraft and was in danger – they had been attacked several times.

Mr T and his children live a simple life, with few modern conveniences. His greatest wish now is to extend the house and buy more furniture. The only furniture which has been bought is a kitchen cupboard. It was bought on hire purchase by his wife shortly before her death and has recently been paid off.

Although by no means without conflict, Mr T has ultimate decision-making powers within the household.

In my time woman would not argue with you, now even my daughters argue with me. Sometimes they tell me where to go. The world is all wrong. It's that Mr What-you-call? Mr Madiba who created all this confusion, by giving these women a chance to talk, argue and discuss things with us. This education has spoilt things.

His daughters do all the domestic work once they come back from school. He spends most of his day listening to the radio, visiting friends or the shebeen. Although he prioritises his needs he does take the responsibility of raising his children seriously. Mr T is vehemently opposed to television as he believes that it corrupts the youth:

I have no intention of buying a television set at all as I cannot stand all the dirty things I see on TV. In fact if I gets to a house where they are watching TV I leave for the shebeen instead or go back home and listen to my radio. Television has corrupted children so much. We grew up knowing that certain things can only be done at night, in the dark, in the privacy of a man and his wife, but now children engage in these things in broad daylight, I would not be surprised if my own daughter fell pregnant during the day, in this house, maybe when I had gone to Whittlesea for my pension. The worst thing is that the very people in the government are encouraging children to use these "rubbers", and then encouraging them to abort if they get pregnant. What is going to happen now is children will be queuing in the hospitals and doctors' surgeries for abortion if they don't try to do it themselves, because they have the permission from higher authorities.

Of his R410 pension per month approximately R300 is spent on groceries. He buys them from a local spaza shop on credit. He pays off his debt every two months when he receives his pension, but then purchases more goods on credit. The only item which he buys for cash is beans, which he gets for R25 from a woman at Tambo. Paraffin costs them R1.80 a litre and they use two a week. He does not believe in buying in bulk because things do not last as long. He is also suspicious of his children and believes that they sell the groceries he has bought.

He is aware that he is not saving money by having electricity and resents having to pay each month as sometimes he worries about whether he will be able to make his payments. Although his preference is for a card system, so that 'I can save', Mr T has managed to pay for his electricity every month.

Similarly, Mrs G (household 8) has also managed to pay for electricity each month. Although she receives approximately R100 per month more than a pensioner does, she has a large number of children to support. Cooking is always done on a wood or

dung fire and paraffin is seldom used. Prior to electrification, paraffin and candles were used for lighting. She used to spend approximately R10.20 each month on fuels for lighting – one bottle of paraffin each week (R1.80) and one packet of candles (R3.00). Although she had a television, bought on credit from the store in Whittlesea for R390, she has only used it since she received electricity. She. Being able to use her television is clearly what motivates Mrs G to pay her monthly charge for electricity. Also, as she can rely on her networks to provide for her needs, she can afford to pay R15 a month: 'I would rather go without food than not pay the R15 for electricity as long as I know that I will get something from the neighbours.'

Household 8: I am poor

Mrs G lives in a one-roomed house at Tambo with her seven children and one grandchild. Everyone at Tambo considers Mrs G to be one of the poorest people, if not the poorest person, in the village. Mrs G herself feels that she is very poor:

I am poor because I don't not have money to fend for myself and my children and I am relying on this money from welfare. I think things would be fine if at least I had R3000 or R4000 every month. Maybe the government can make it possible for me to get this money. It has been much harder since my husband died. His pension together with the grant made life better for me but now since he died I have definitely got poorer.

She has few possessions: all the clothes, papers and small items are packed into three suitcases in the corner of her house. Her sagging bed, a rickety bench, a broken chair and a small kitchen cabinet are the only furnishings. Food is cooked on a fire on the floor of the poorly ventilated house. Mrs G's health is poor and according to her is worsened by her smoky environment. Mrs G gets R1040 every two months from the state welfare grant she receives for four of her seven children. Although one of her sons works as truck driver in KwaZulu/Natal she does not ever hear or receive remittances from him. Due to her poor health she has never grown any food, but she has access to credit at the store in Wittlesea where she usually has an approximately R400 debt. The household sometimes has only one meal a day.

There is no question that Mrs G is poor, and she may well be amongst the poorest of the poor. However, the knowledge of her poverty and the 'high profile' this receives in the village makes it easier for her to borrow. Unlike others we interviewed she is not embarrassed about borrowing. Alongside the welfare grant, borrowing from others is an important livelihood strategy.

I borrow almost everything: food, money, fuel and an iron from my neighbours and from my brother and mother in Whittlesea.

Unlike the households discussed above, Household 9 has more livelihood strategies: pension, informal work, credit, livestock and a vegetable garden. However, it has been unable to pay the flat-rate tariff and has had its electricity supply cut off. The main reason for this is that the husband has prioritised expenditure on his cattle over and above the needs of the household, and the ability to buy food, and pay for the electricity has been compromised. The gender relations of power within the household are such that the husband is able to assert his needs over those of the other household members.

Household 9: Pensioner - livestock priorities

Mr and Mrs F were both born in Lady Frere. When they got married they moved to Dimbaza near King Williamstown where they lived and worked as factory workers for 16 years. When they visited their cousin at Tambo they decided that they would like to move there and started negotiating for a place of their own. The cousin, who was on the village committee, helped with the arrangements and they moved to Tambo in 1994 prior to the national elections.

Mrs F is 47 – 21 years younger than her husband. They have four children, three of whom are at school. The oldest boy is 22 and he dropped out of school (Std 10) in June. He has been a source of worry to his parents as he started wearing dreadlocks, smoking dagga, associating with 'bad' groups and then dropped out of school. Although he already has his own piece of land for the time when he wants his independence, he stays at home 'doing nothing' except for taking responsibility for herding the livestock. They have five sheep, ten goats, a number of chickens and about ten cattle.

Their primary source of income is Mr F's pension. As he still gets it from Dimbaza, he has to pay transport costs in order to fetch it. Mr F supplements the household's income by fencing

people's yards, for which he earns about R250 per job.

Besides the expense of daily living, a major expense in this household is the lucerne which is bought to feed the cattle. The lucerne costs R150 and lasts only ten days. Mr F 's cattle are very important to him and he 'would rather go without food than see his cattle die of hunger because of the drought'. Although the household benefits from the availability of sour milk, the ability to meet other household needs are clearly compromised. According to Mrs F, her husband is

very strict and aggressive but he is a good husband and father. He has matured through the years as he used to beat me up when we were newly married. If I had gone to collect firewood and came home much later than expected I would be beaten.

Although this no longer happens, it is clear that Mr F makes all the major decisions and determines where his pension moneys are spent. Money to support his drinking also places a drain on the household resources:

He drinks a lot but the good thing about him is that he sleeps a lot when he has had a lot to drink, he does not bother anybody, he only does when he is sober.

Finally, Ms E of Household 10 is extremely impoverished. It is not surprising that she cannot afford to pay for her electricity at all. However, it is interesting that despite her desperate situation, she does not use a wood or dung fire (which are free) to cook with. The reason for this is that she has a set of beautifully kept enamelled pots which her mother gave to her. Rather than ruin them on a fire, she will not cook food if she has no money available for paraffin.

Household 10: No income - cut offs

Ms E, a woman in her mid thirties, lives alone and has been at Tambo for four years. Prior to moving to Tambo, she lived with her family at Sada. She moved because 'we were overcrowded at Sada, staying with my sisters and brothers, I needed my own space. We all have children.' E has a seven year old daughter in Sub A. The daughter stays in Sada with E's sisters and brother and comes to Tambo during the holidays. Her child's father left her when she was pregnant and did not help with maintenance. She is not worried about not having a husband: 'it's easier this way for me, nobody tells me what to do, a husband would give me many children and then not look after me'.

E is a trained traditional healer who depends entirely on income derived from this work for survival, and lives from hand to mouth:

They pay me a consultation fee of R30, this they must pay before I can attend to them, some never pay the balance and I never see them again, so I depend entirely on what I get from people. Sometimes I go without any money for the whole month.

One of the problems is that her client base is not well established in Tambo village:

Although I am this small and I know some people look down on me because I am a woman, most people recognise my good work. People don't know me that much here in Tambo, but where I come from people used to respect me even though I am small, I had many patients there, that is why I have only one patient in Tambo. That is where I got my name Nontando bedela/ Nozabedela (I am liked even though small and therefore I may be looked down upon)

Survival is a struggle. During the first fieldtrip she did not have any money and was borrowing food from her neighbours. At the time of the second, she explained that she had survived because someone who owed her R40 paid her and she was able to buy a few groceries. As long as she has paraffin, mealie meal and maybe a loaf of bread, she is satisfied.

All the households discussed above fall below the absolute poverty line, whereby the minimum level of welfare required by a rural household of two adults and four children is taken to be R723 per month (RDP 1995). However, such a distinction is not necessarily useful in determining whether households will be able to pay a flat rate tariff of R15 per month. The discussion above illustrates that, in fact, there are a range of factors, which together with income, influence this and that these will differ from one household to the next.

For the very poor, such as Household 10, there is little to discuss. They can clearly not afford to pay R15 every month. The situation is a little different, however, for households which depend on state pensions and welfare grants for their income.

Both the results from the survey and the in-depth interviews revealed that the pensioners were amongst those households which found it difficult to pay the flat rate tariff. Although there is a steady income, the ability for households to absorb any crises or unusual demand on their financial resources is limited. It is unlikely that such demands will be met without compromising other needs. The examples above reveal how expenditure was prioritised at one point in time. At other times, different needs may be prioritised.

At Mafefe, similar results were found. At the time of the fieldwork for the research, the flat-rate tariff had been raised from R8.50 to R15. After one month of paying the increased tariff 'more than 50' of the 790 households with a 2.5A supply had been cut off as a result of non-payment. It was found that the flat rate was particularly burdensome on pensioners as the pension is often the sole source of income for a household. During the second field visit to Mafefe a consumer boycott was organised to protest against the increase. People felt that paying R15 for lighting only is too much (Wentzel 1997). Clearly, it is.

This remains a central dilemma for rural electrification. Should we be investing in rural electrification to provide households with lighting? The answer is not uncomplicated. It is important that we address the poverty and underdevelopment manifest in South African rural areas. Quite how one measures the benefits of electric lighting as opposed to other kinds of lighting is not easy to answer. It is crucial, however, that electricity should not exacerbate a household's energy poverty or further compromise its ability to survive.

2.6.1 The impact of electricity on household energy budgets

One of the most important issues to examine is the impact of the 2.5A flat-rate tariff on the household energy budgets. To explore this it is important to examine whether electricity places a financial burden or leads to cost savings for households. The Mafefe post-electrification study suggests that electricity has had a negative impact on very poor households. It is worth examining two of these households as case studies in order to understand this more clearly.

Household 11: No income

Mrs C, 53, lives at Mafefe with four of her children and three grandchildren. She has no regular source of income, but tries to earn money by making mud bricks and building mud houses for people. In order to earn enough from this task she must collect her own soil and cow dung. Her earnings are small: for example, R100 for a two-roomed house, R25 for a yard wall. Sometimes she will collect dung for people and will charge them 20c for a 20 litre tin. Her sons help her to dig the soil when she is building, whilst her daughters collect wood to sell and receive R10 per bundle. Mrs C is desperate for a pension, but has to wait another seven years. She does not think she will be alive by then.

Coupled with the lack of opportunity to earn enough money, Mrs C has no land to plough and no livestock: 'I have nothing.... I am just a person of God'. Although she has borrowed and continues to borrow from relatives and neighbours, she is concerned that it 'disturbs' them.

Her house has two rooms, although she has built another three-roomed house from mud bricks. Her sister's son gave her a bag of cement, a window frame and a door frame. He has also promised to give her corrugated iron for the roof. In the meantime she has no poles for the beams and her house has no roof. She is worried that it will collapse if a roof is not put on before the rains come.

None of the children are at school as she cannot afford to send them. Even though no-one can be denied access to schooling according to the new constitution, her one son left school because he felt intimidated by the teachers because he could not afford to pay school fees.

Household 12: Single pension, no land and grandchildren to raise

Mrs D was born in Marakeng, but was 'chased' from there by the white farmers. From Marakeng she moved to The Downs with her husband and their ten children. At The Downs, her husband owned land where they used to grow vegetables. Four of her children died at The Downs due to illness. For a second time in their lives they experienced removals when 'white farmers told them to leave'. As it was under the jurisdiction of the same chief as The Downs, Mrs D and her family moved to Mafefe where they slept on 'the mountain' until the chief gave them land. Although they were allocated land for a homestead they were not given land for planting. Her husband used to drink too much and was ill. He died four years ago.

Mrs D receives a pension of R410 per month, with which she supports four grandchildren, but she is not clear how much money she eventually brings home. In order to cash in her pension cheque she is forced to buy things from the market – usually oranges and peaches. But she is not aware of how much she is charged or how much she spends. Her daughter does not send home remittances, although she does pay for her children's school fees and often brings money and clothing when she visits once a year at Christmas. Although the eldest grandson (22) is in Std 7 he does informal work, such as helping people to build houses, when he has the time. This money is used to pay for goods which are required by the household.

Mrs D and the grandchildren have planted vegetables and fruit trees in the yard. However, she feels that it is difficult to do this as she is now old.

It is clear that both of these households are vulnerable. Rather than impact positively on these households, access to electricity has placed stress on both of them. As household 12 has a stable income it has been able to prioritise expenditure on electricity. This has, however, not come without compromising expenditure on something else.

Household 12 used to buy four litres of paraffin (R9.60) prior to electrification, as well as a packet of candles (R2.50). Through these arrangements all four rooms in the homestead could be lit by using either a paraffin lamp or candle. The current situation, however, has led to lighting being available in one room only, as the electricity has been installed in the children's room and none of the other rooms have been wired. As no more paraffin is being purchased, the grandmother goes without lighting in her bedroom. Only one candle (80c) is bought, for times when, through technical problems, electricity is not available. Prior to electrification this household spent approximately R11.50 on lighting. Although not of good quality, lighting was available where needed. Once electrified, the household paid R8.50 for the first seven months and R15 for subsequent months. Quite clearly, this situation is untenable. The electricity tariff has resulted in the inability of the household to meet its lighting needs (even in the instance where R8.50 was paid).

Household 11, on the other hand, has stopped using electricity altogether. This household has made an investment in electricity, albeit a small one, by paying for the connection and wiring the homestead with three light bulbs: two outside and one inside the two-roomed house. This is not insignificant, given the household's circumstances. However, they have not paid their electricity bill for the last two months. Mrs C feels that it is useless to report to the agency that she cannot afford to pay. They use four candles a month – which is cheaper than paying for electricity. She feels that electricity is useless for her and that it is only for rich people. Thus, for this household, which exists in extreme poverty, the flat-rate tariff of even R8.50 is unaffordable. Buying candles is cheaper and having to pay for electricity places a burden on the household.

At Mafefe, it seems that the relatively better-off households, particularly those with businesses, benefited from electricity. In one household, where a shop is run from the home, it was found that with electricity more energy services could be had for less money. Prior to electrification, the household spent approximately R300 on gas for two freezers, whereas the current situation with three freezers, one electric hotplate, an iron, radio and six lights leads to electricity bill of between R200 and R250 per month (Wentzel et al 1997).

2.7 Unstable, unreliable and infrequent rural incomes

At both Mafefe and Tambo, project work is an important source of income. Work on projects is neither full-time nor consistent. What households will do in order to survive, once this project work is completed is not clear.

Household 13: Unreliable project work

Mr and Mrs H live at Tambo with their four children. They moved from Hewu, arriving at the beginning of 1995 when 'everybody who was looking for a place to stay was welcome in Tambo'. They started building their permanent home of four rooms in March 1996 and the structure was completed in June of the same year, although details such as plastering and glazing of windows are still incomplete. As the household no longer has a regular source of income, they cannot afford to buy materials or pay for labour.

Mr H used to be a mineworker in Welkom. He was retrenched and now the only source of income for the household is the 'piece work' he gets on projects in the village. At the time of the fieldwork, he was employed on the water project, where a reservoir was being built. Sometimes there is no work for weeks at a time. Also, there is a limit to how long these infrastructural projects will provide work to the village residents.

There is similar evidence from other households at both Tambo and Mafefe and one is continually struck by the transient nature of rural households. Where households at Tambo and Mafefe are overwhelmingly dependant on pensions for survival it is important to recognise that the death of the pensioner will have a dramatic effect on the household as the primary (or often sole) source of income is removed. Similarly, households dependant on the remittances of migrant husbands or children often have variable and infrequent income. The amount remitted may vary and/or there may be some months when no remittances are received.

The point is that the flat-rate tariff militates against households paying less for their electricity. Also, households had to pay a reconnection fee when they had defaulted on their payments and were disconnected. Whilst the 20A households are able to discontinue their use of electricity without paying a reconnection fee, 2.5A households expressed the feeling that they were being penalised because they were too poor to afford the R200 connection fee for the 20A supply.

Finally, the unreliable manner in which pensions payments are made has also made it difficult for pensioners to make payments on time at Tambo. Very often, pensioners are paid as late as the 8th of every month. This means that pensioners are not able to meet their monthly payments, even if they intend to do so, before they are disconnected. They are penalised for non-payment as a result of circumstances which are not under their control. This is clearly something which can be resolved with Eskom's accounting departments. A further complicating factor is that pensions are paid out on a two-monthly basis at Tambo. According to recent developments in the welfare policy arena, this should be standardised. Until such a time, however, it is important that Eskom is flexible and facilitates the payment for electricity in a way in which is suitable for these households.

2.8 Enjoying the benefits: the importance of information and education.

Although the importance of ensuring that households have information about electricity and the implications of having access to current-limited supplies has been pointed out by both James (1996) and Thom (1996) in their reports on Tambo and Mafefe respectively, it is worthwhile emphasising this point again. It is particularly evident in the Mafefe case study that households' lack of information has impacted negatively on their ability to enjoy the full benefits of their electricity supply. It was found that households were not aware of the appliances which could be used with 2.5A supply (Wentzel et al 1996). Also, the general understanding of electricity use was found to be lacking and this sometimes limited the benefit derived from the

supply; for example, one household did not use their outside light when it rained for fear that it would break.

It is instructive to contrast this with the post-electrification situation at Tambo. Fewer people at Tambo misunderstood the implication of having a 2.5A supply. People were not necessarily happy with the current-limited supply, and nor did they feel that the questions they had, such as why other villages were getting access to 20A with a R45 connection fee, had been answered. Clearly, it is never possible to make sure that all people in a village are informed. However, the close working relationship which Eskom had with the committee, as well as their investment in an education programme, clearly resulted in fewer misunderstandings.

3. THE EFFECT OF ELECTRICITY ON RURAL ENERGY USE

In 1995 when Davis and Ward conducted an analysis of rural household energy use patterns, they noted that there was 'very little experience or understanding of household energy-use patterns where electricity is available' (1995: 2). With limited experience of rural electrification in South Africa there were few studies which examined the effect of electricity on rural energy use. Of particular importance were that:

- there were few studies using qualitative methods to assess the impacts, value and use of electricity in rural households existed;
- most electrification studies had been undertaken by Eskom and were market studies using quantitative survey methods;
- no longitudinal studies had been undertaken in order to assess the shift in energy use (with access to electricity) over time;
- no attempt was made to understand the use of electricity in the context of people's energy use and other livelihood strategies;
- no pre- and post-electrification studies existed.

The project of *The role of electrification in the integrated provision of energy to rural areas*, which began in May 1995, has attempted to address some of these problems by undertaking a number of case studies. It is clear, however, that these studies represent only the beginning of a process to extend our knowledge of the end-use of electricity in rural areas. It is crucial that further research is undertaken as the electrification programme progresses.

With an inadequate body of knowledge on rural electricity use at a household level it is difficult to make conclusive statements about what technology options will be appropriate and affordable for rural households. A number of important and pertinent points have emerged from rural energy studies, however, and these will be highlighted in the discussion to follow. Information from the following sources was used:

- the rural energy use analysis conducted by Davis and Ward (1995) of the Project for Statistics on Living Standards and Development (PSLSD) survey conducted by the South African Labour and Development Research Unit (SALDRU);
- a post-electrification study of a 60A electrification project at Loskop in KwaZulu/Natal where households have been electrified for between four and seven years;
- the 2.5A pilot projects at Tambo and Mafefe, where households have been electrified for less than one year;
- a qualitative study on farmworker electrification the Free State;

- a study of the impacts of electricity on small-scale agriculture in KwaZulu/Natal.

Although the discussion separates out energy services which are available with a 2.5A supply from those which are not available, it draws on information from all of the studies listed above.

3.1 Income categories used in this report

<i>Saldru data: Davis & Ward 1995</i>						
Expend categories	Low (<130)		Med (<270)		High (>270)	
% pop	30		40		30	
<i>Saldru data: Afrane-Okese 1997</i>						
Expend categories	<100	<200	<300	<400	<500	>500
% pop	29	37	18	8	4	5
<i>SA to Z data: 1996</i>						
Income categories	<200	<500	<800	<1400	<2500	>2500
% pop	9	37	22	18	9	6

Table1: Percentage of rural population in relation to per capita expenditure or household income

The income categories used in this report were determined by Davis and Ward (1995) in their analysis of the Project for Statistics on Living Standards and Development survey data. Low income refers to households with a monthly expenditure of less than R130 per capita, high income refers to households with a monthly expenditure of greater than R270 per capita whilst medium-income households fall between these two income groups.

Most surveys, especially those undertaken by and for Eskom, categorise the rural population according to household income. As mentioned, however, the Saldru data used by Davis and Ward is analysed according to per capita expenditure. For this reason table 1 has been included to allow for comparison of these two analytical approaches.

3.2 Energy services of the 2.5A supply

With a 2.5A supply of electricity it is possible to use any appliance which does not require more than 560W to operate, effectively meaning that thermal applications are not possible, although certain appliances, such as irons and kettles, have been adapted to operate with a 2.5A supply. They are not currently freely available on the market.

Multiple fuel use is a widespread phenomenon in poor rural households. The PSLSD survey found that 86% of electrified and 96% of unelectrified households used more than one fuel to meet their energy needs (Davis & Ward 1995). In higher-income households, fuels such as paraffin and wood are often displaced by electricity, whilst in low-income households electricity is used as an additional fuel.

The qualitative studies conducted at Loskop, Tambo, Mafefe and of farmworkers in the Free State also point to the prevalence of multiple fuel use in all households. The discussions to follow will highlight some of the findings in this regard.

3.2.1 Candles and paraffin are still used for lighting

The quantitative analysis undertaken by Davis and Ward suggested that as much as 60% of the electrified sample also used candles and paraffin for lighting.

	<i>Income group</i>	<i>Candles only</i>	<i>Candles & paraffin</i>	<i>Paraffin only</i>	<i>Elec. only</i>	<i>Elec. & paraffin</i>	<i>Elec. & candles</i>
<i>Electrified households</i>	Low	22	9	3	13	3	48
	Medium	11	7	2	11	10	56
	High	7	2	2	30	8	50
<i>Unelectrified households</i>	Low	35	48	15	0	0	0
	Medium	35	47	15	0	0	0
	High	36	40	21	0	0	0
<i>Total elec.</i>		11	5	20	20	8	52
<i>Total unelec.</i>		35	45	0	0	0	0

All other fuel choices together account for less than 5% of the sample

Table 2: Households using fuel for lighting (%)
Source: Davis and Ward (1995)

Not only do the qualitative post-electrification studies substantiate this analysis, but they also provide insights as to why electricity does not displace other fuels used for lighting.

At both Tambo and Mafefe, after less than one year, candles and paraffin are still being used for lighting mainly because not all rooms in houses are electrified (Wentzel et al 1997; James et al 1997). Households are provided with a readyboard where the sockets and, in the case of the 2.5A supply at Tambo the light fitting, is found. Thus, lights fittings and plugs are only located in one room. Eskom does not provide materials or undertake to wire other rooms in the houses. Households have to bear the cost and/or labour for this. The survey at Tambo suggested that only 24% of the households had wired rooms other than the one in which the electricity was installed, with more than 60% of these households wiring one additional room only.

In very poor households at both Tambo and Mafefe no house wiring has occurred. It was found that the placement of the readyboard is an important consideration where wiring of the house is not anticipated in the near future. For example, a household at Tambo made sure that the readyboard was placed alongside the doorway to the second room in the house so that the light could shine through into the next room.

Other factors also influence whether rooms are wired. For instance, at Mafefe, it was found that one household used paraffin for lighting instead of electricity as the grandmother was afraid of electricity. At Tambo one woman did not use the electric light in her room, even though it had been wired, as she found it inconvenient to get out of bed to turn the light off.

The type of light fittings provided by Eskom with the readyboard has influenced whether households have an outside light. At Tambo the 2.5A readyboard includes a sealed light fitting, whilst 20A readyboards are provided with a lamp shade. Many 2.5A households have removed the sealed light fitting from the readyboard and placed it outside. Very few of the 20A households have outside lighting.

As households at Tambo and Mafefe have not had electricity for long, it is likely that more will wire their homes. Qualitative information on households which have had access to electricity for longer is not complete.

One of the only qualitative studies (which also included data from a quantitative survey) of rural electrification was undertaken at Loskop, where households have been electrified for between four and seven years. There seems to be a trend here towards the almost exclusive use of electricity for lighting. It was found that candles, and occasionally paraffin lamps, were used in outbuildings and when power failed

(Annecke 1996). The research study of Loskop provides no further information, however, on household wiring or multiple fuel use for lighting in the context of access to electrification. Thus, our understanding of the effects of the length of time electrified and exclusive use of electricity for lighting remains incomplete.

3.2.2 Irons and kettles

In their analysis, Davis and Ward (1996) found that 40% of electrified rural households use electricity to heat water and 20% of these use only electricity. Electricity tends to displace other fuels for heating water to the greatest extent in the highest income category.

At Loskop it was found that that 60% of household had kettles (compared with 80% which had electrical hotplates). Kettles are preferred to hotplates for heating water, as it is considered cheaper (Annecke 1996). Although it was found that kettles were used to heat water for bathing, wood was still the main fuel used to heat water for this purpose.

At Tambo, none of the households interviewed (either 20A or 2.5A) had bought kettles or irons. Only those 2.5A households which had received low-Watt irons and kettles from Eskom had these appliances. There were, however, households which expressed the desire and were savings to buy either an iron or a kettle. Interestingly, one 2.5A household which had a kettle did not use it regularly as it took too long to boil – the same amount of water boiled quicker on the paraffin flame stove. The few households with irons were happy with them.

3.2.3 Radios and TVs are still run on batteries

Every one of the qualitative post-electrification studies suggest that households are unable to enjoy the benefit, and cost saving, of using electricity to operate radios. At both Tambo and Mafefe, none of the households interviewed were able to power their small radios with electricity. Most radios have no internal mechanism to use electricity and there are no conversion mechanisms available. As a result, electricity is being used for lighting only, particularly amongst the very poor at Tambo and Mafefe. Dry cell batteries are still used to power radios. Thus, electricity often places a burden on household energy budgets as expenditure on both electricity and batteries occurs.

At Loskop, where households have been electrified for much longer, similar results were found (Annecke 1996). With farmworkers in the Free State it was found that in addition to not having mechanisms to run their radios on electricity, farmworkers did not know that their radios could be powered with electricity, nor did they have the money to buy new radios which could run off electricity (Hofmeyr 1996). It was found that the expenditure on batteries was high, especially when considered as a proportion of wages.

At Tambo, television sets also continued to be powered with car batteries. There were a number of households where televisions tripped the electricity supply when switched on. All of these households had previously run their televisions on car batteries. Thus, in addition to paying for electricity, these households continued to spend money on charging car batteries (James et al 1997).

It is also worth noting that television reception is not available at Mafefe without considerable cost as the transmission network does not extend to the area. Thus, the service available to households with the 2.5A is reduced.

3.2.4 Refrigeration and income generation

It seems that refrigeration is most often prioritised by households which intend to use it for income-generation (James & Ntutela 1997; Annecke 1996). In a number of case studies of rural electrification it has been noted that refrigeration has impacted positively on people's livelihoods. Although the same effects can arguably be

achieved with other fuels, in some instances electricity is cheaper. For example, the energy expenditure of households which ran spazas and stores decreased with access to electricity (Wentzel et al 1996). Although it is clear that electricity does not lead to growth of small businesses, it expands their scope by enabling the sale of perishable and frozen food and drinks (Auerbach 1997; Annecke 1996). For instance, at Loskop it was found that, together with other factors, electricity has played an important role in contributing to the development of general dealer-type stores. The other factors include shifts in dietary habits; higher income contributions due to weekly, rather than monthly or annual, migration; and the impeding role violence has had on people's movements.

In Mafefe, access to electricity allowed for one woman to establish a spaza where she sold frozen fruit juice and other perishables, such as meat (Wentzel 1996). Similar results were not found for Tambo, although one of the women who ran a spaza expressed the desire to purchase a fridge in order to expand her business. Another important way in which households generate income is through hiring out space in fridges to neighbours (Annecke 1996).

3.3 Cooking with electricity

There are a wide range of appliances which cannot be used with a 2.5A. In terms of the needs of the majority of rural households, it does not seem to be a problem that the 2.5A supply cannot provide certain electricity services. For example, geysers are not common in rural areas and it will be only the very affluent who prioritise expenditure on them. Similarly, the use of dishwashers, washing machines, heaters and other appliances common to middle-class homes are unlikely to be prioritised in rural areas.

It is substantially more difficult to say the same for cooking, however. The information available on electricity use and cooking is complicated and some of it contradicts the prevalent opinion that the majority of electrified rural households do not make use of electricity for cooking. Interesting insights have emerged from the qualitative studies. According to Davis and Ward's (1996) quantitative analysis, one third of electrified rural households use electricity for cooking, often in conjunction with other fuels. There is also a trend away from wood towards paraffin in non-electrified households and towards electricity in electrified households. Although electricity is only likely to be used substantially in higher-income rural households, 10% of low-income rural households do use electricity, in conjunction with other fuels, for cooking.

	Income group	Wood only	Wood & paraffin	Paraffin only	Elec. & paraffin	Elec. only	Elec. & other
<i>Electrified households</i>	Low	26	45	5	5	0	10
	Medium	16	34	10	13	2	13
	High	4	7	10	21	26	15
<i>Unelectrified households</i>	Low	28	60	5	0	0	0
	Medium	24	55	7	0	0	0
	High	18	49	16	0	0	0
<i>Total elec</i>		12	25	9	15	13	14
<i>Total unelec</i>		24	56	9	0	0	0

All other fuel choices together account for less than 10% of the sample. The electricity/paraffin combination is included under 'Electricity & other'.

Table 3: Fuels used for cooking by rural households(%)
Source: Davis and Ward (1995)

Annecke (1996) found that approximately 80% of the households in the Loskop survey had acquired either a single solid-plate hotplate or a two-spiral-plate electric stove. This figure is surprisingly high, considering that hotplates were not given to households as part of the electrification programme. The majority of these households had purchased the hotplates new – either on hire purchase or with money from working children or pensioners. A few had bought second-hand stoves and about one third had been given them by returning migrant workers.

The households which consisted of men only tended not to have electric stoves, as well as households which considered themselves to be 'too poor' or did not like electricity for cooking. It is unclear from the study why men prefer not to use electricity for cooking, although similar results have emerged at Tambo village (refer to Household 7, page 11).

Although households owned hotplates, there was not a displacement of other fuels by electricity (Annecke 1996). A variety of appliances and fuel combinations are used for cooking. It was found that, in all households, stoves used prior to electrification (wood, paraffin, gas) were still in use. Although it was difficult to quantify, the research suggested that these other fuel and appliance combinations were used as often as the hotplates were. Similar results were found at both Tambo and Mafeke in households which had acquired hotplates and stoves. None of the households had switched over completely to electricity and other fuels were still used in conjunction with electricity. Only food which cooked quickly was cooked with electricity.

Possibly the most important issue to emerge from the Loskop study, which may explain the high levels of appliance acquisition, is the distinction between waged and unwaged women's electricity use-patterns. Employment opportunities do exist at the nearby town of Escourt, where both men and women are employed as part-time shift workers in the factories. It was found that electricity was used for cooking far more by waged women. Annecke (1996) argues that this is due to affordability, as well as convenience. Waged women are more likely to have wider fuel choices because they earn money and make decisions on how it is spent. Also, earning money places constraints on women's time. Due to traditional gender relations women are still responsible for domestic work, despite the fact that they are also doing productive work; in order to ensure that they can fulfil their responsibilities, electricity is used.

Where women have control over income and experience increased demand on their time, it may be likely that electricity will be extensively used for cooking.

3.4 What are the essential electricity needs of rural households?

What does all this information mean for the provision of current-limited supplies of electricity?

For all end-uses there is little total displacement of fuels by electricity. While other factors, such as people's preferences, are important, the cost of acquiring appliances and wiring equipment is a major constraint to shifting towards exclusive and/or extensive use of electricity. Although there is little data on the effect of the length of time that households are electrified, there seems to be a trend towards acquiring more appliances and spending more on electricity. Although the costs associated with consumption do not feature in household's decisions to acquire hotplates, the consumption costs of thermal applications continue to influence the persistence of multiple fuel use.

Implementation of current-limited supplies, and the 2.5A in particular, has been justified in terms of providing electricity that will provide for 'only essential electricity needs such as, lights, media and refrigeration' (Barnard 1996). It is, however, important to reflect on this statement. What makes electric lighting more

essential than electric cooking or water-heating? According to which rural households have these needs been defined as essential?

The assumption that essential electricity needs include lighting, media and refrigeration has been based on generalised appliance acquisition and electricity consumption data. This is not surprising, given the paucity of data on rural energy use. However, some of the qualitative studies show that there are marked differences between localities and that the conditions in rural households are different. Although 'difference', 'diversity', 'local specificity' do not make policy- and decision-making easy, it is important that our national averages and generalisations do not lead to policies which fail to make provision for needs which may exist in a specific locality or amongst a particular group. For instance, the incidence of cooking with electricity at Loskop contradicts national averages. Clearly, we cannot base our rural electrification policies on the conditions in one village. However, the Loskop study brings to light an important trend where women who have access to a stable source of income tend to use electricity more extensively for cooking. This should clearly be considered in the rationale for electrifying rural households.

For many decades development theorists and practitioners have argued that women are short-changed in the development process due to the lack of awareness of women's needs. Providing current-limited supplies to women requiring electricity for cooking runs the risk of perpetuating this trend. Moreover, if women's labour time was valued, the opportunity cost of providing electricity for cooking, albeit only for convenience and time saving, would be considered. It is important not to overemphasise the use of electricity for cooking, but it is important to question the validity of excluding cooking from the 'essential' electricity needs list. This is especially important given that similar trends are visible for lighting. Very few rural households have invested in house wiring, with the majority of rural households using candles and paraffin in conjunction with electricity for lighting. Thus, for both end-uses, households have not invested in extending their electricity use. There seems little basis, then, to suggest that lighting is more essential than cooking.

4. ARE CURRENT-LIMITED SUPPLIES APPROPRIATE?

What does all this information mean for the provision of current-limited supplies of electricity? The issue is complex and it is apparent that a single response on whether current-limited supplies are appropriate is not possible. It is also inevitable that whatever is proposed will not meet every rural person's needs.

There are important criteria, however, against which decisions on current-limited supplies should be made. First, it is vital that we consider the position of the very poor and ensure that no electrification strategy exacerbate the condition of poverty and vulnerability of these households. Secondly, systems of payment must enable rural households to have control over their expenditure on electricity. And finally, where specific electricity services are considered to be beneficial and valued by rural people every effort should be made to deliver these.

It is worthwhile spelling out what these criteria mean for the implementation of current-limited supplies. It is obvious that we cannot speak of rural households as an homogenous category of electricity end-users. As we have seen, it is only useful to use income levels as a very broad differentiation between rural households. Within the same income level category the factors which shape livelihoods, including energy use, vary greatly from one household to the next. Bearing this in mind, we can begin to outline how an electrification strategy with current-limited supplies could be shaped in order to be acceptable and appropriate.

Higher-income rural households are able to pay high connection fees

Rural households with relative wealth are clearly not a complicating factor in the discussion on current-limited supplies. Although higher levels of supply are generally required, these households are able to afford and prioritise expenditure on connection fees which are in excess of the standard fee of R45 which is currently charged. Furthermore, as the acquisition of appliances is relatively problem free these households are able to enjoy the benefits of electrification. Bearing this in mind, it is important that an electrification strategy does not aim to provide a current-limited supply of electricity only. Current-limited supplies should be provided as one of a range of supply options. It is critical to acknowledge that rural areas, no matter how 'remote' we imagine them to be, are stratified and we need to develop an electrification strategy which accommodates different needs.

The 2.5A supply is a good electrification strategy for the very poor

The position of other households in rural areas is slightly more complicated. First, it is important to consider the case of the very poor. In the face of the struggle to survive, it is unlikely that the very poor will ever be in a position to enact their desires or fulfil their needs with regard to electricity. The 2.5A supply of electricity is a welcome and important service as it provides the opportunity for improved quality of life, at the very least, through the provision of good quality lighting. Inspired by the equity goals of development, in the context where there is the political will to redress the inequalities in service provision, it is important that the very poor also benefit from electrification.

The flat-rate tariff, however, clearly militates against the sustained use of electricity by the very poor. In fact, as this paper showed, the flat-rate tariff resulted either in households being unable to use their electricity supply or in stress on household budgets. Equally important is the finding that poor households were paying more per month for the same electricity service (for example, lighting) than other households, which were able to pay a higher connection fee for a higher level of supply with a pre-payment meter. Aside from the inherent inequality in this, such a situation can have little impact on improving the conditions of poverty. The possibility of introducing a low tariff, such as R5 (which is equivalent to the smallest electricity card available), should be explored. Furthermore, these very poor households should not be penalised for being unable to spend money on electricity in one particular month. Therefore, the imposition of reconnection fees is not appropriate. As the most significant cost savings associated with the 2.5A supply arise from not having to provide a meter, it is probably not worth contemplating the provision of this level of supply with a meter. However, this means that other means of ensuring that flexibility and end-user control over payment must be found.

There is merit in pursuing the notion of an appropriate community-based institution to take responsibility for some of the revenue collection functions. If such an agency is formulated to suit the conditions at a local level, it could potentially introduce an approach to revenue collection which takes account of the dynamics and circumstances of a particular locality.

Finally, at the risk of repeating the recommendations of numerous energy studies, it is worth pointing out that for the poor to benefit from electrification it is essential that appliances are affordable and easily available. For instance, developing cheap mechanisms to convert battery operated radios to electricity will result in improved benefits.

With an appropriate tariff and connection fee, the 2.5A could be an important electrification strategy targeted specifically at the very poor.

Households require electricity for thermal applications

Finally, we need to examine the electricity service needs of rural households which fall between the broad categories of 'very poor' and 'relatively wealthy'. The paper has suggested that there are households which are likely to be dissatisfied with what a 2.5A supply of electricity can provide, especially because it does not allow for cooking. From an end-use perspective it seems that the role of electricity in cooking is the critical factor in the decision-making process about current-limited supplies.

It is difficult to quantify the demand for cooking with electricity. However, there are a range of households which already have hotplates, or are saving for them or desire them. Electricity is used in conjunction with other fuels and at only very specific times, such as when preparing fast cooking food or when time pressures make it difficult for women to fulfil their domestic responsibilities.

As many women in rural areas are primarily responsible for both domestic and productive work in households it is important that strategies are developed which reduce the burden on women. Although such an approach could perpetuate unequal gender relations, it can be argued that it is important to meet women's practical gender needs in the process of development and empowerment. For this reason it is important to provide electricity for cooking. It is quite feasible that a current-limited supply, which makes allowance for limited thermal use, will be appropriate and accepted by rural people. An 8A supply, which can provide electricity for a one plate hotplate is a possible strategy. However, including yet another electricity supply option will make implementation more complex. For this reason it may be more appropriate to develop a strategy which enables households which require electricity for thermal applications and cannot afford high connection fees to gain access to a 20A supply.

The critical issue with regard to these households is the 20A connection fee. It was found that the connection fee for higher levels of supply at Tambo (20A) and Mafefe (60A) restricted the number of people opting for them. Although most households could not afford the once-off payment for connection, it is quite feasible that households could manage to pay off the connection fee in instalments. There is a strong tradition of hire-purchase payment for furniture, as well as credit from local shops and spazas. Thus, there are two possible options to enabling households to gain access to higher levels of supply:

- reduce the connection fee for the 20A supply; the amount of R45 is known and accepted;
- charge a higher connection fee of, for example, R200, but allow people to pay the connection fee in instalments over a number of months.

It is important that the cost or method of payment for connection does not force people to select a level of supply which does not provide for all their electricity needs. However, if a 2.5A is supplied to the very poor, it is important that the cost of connection for the 20A is relatively more expensive than the connection fee for 2.5A. This will ensure that those households which will never use electricity for thermal applications will select the 2.5A.

Furthermore, it is imperative that the technical design of electrification projects makes allowance for the need to upgrade. The circumstances and needs of households are not static, and it is essential that, where current-limited supplies are implemented, there is the potential to upgrade – particularly where these limits, such as the 2.5A supply, are very low.

In sum

The discussion above highlights some of the important issues to consider in developing an electrification strategy which includes the implementation of current-

limited supplies. There are some important policy questions, which concern the issue of subsidisation, which must be addressed.

The first concerns the notion that a 2.5A supply option is an appropriate electrification strategy for the very poor only. The implicit assumption here is that the very poor should receive a greater subsidy than other relatively better off rural people. Clearly, a decision on whether greater subsidisation of the very poor is an appropriate strategy in the context of a highly subsidised electrification programme, must be taken.

Secondly, if we compare the 2.5A supply option with the provision of solar electricity for lighting, media and refrigeration, it is clear that, without the same amount of subsidisation, solar has very little chance of competing effectively with grid electrification.

Finally, the decision-making process concerning current-limited supplies is largely driven by financial and economic considerations. The socio-political issues highlighted in this paper are equally significant and should inform the decision-making process.

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Current limited supplies, supply options and tariffs

Is the 2.5A supply appropriate for rural households?

With a 2.5A supply of electricity it is possible to use any appliance which does not use more than 560W to operate, effectively meaning that thermal applications are not possible. Although certain appliances, such as irons and kettles, have been adapted to operate with a 2.5A, they are not freely available. In the context of high costs of rural electrification with low levels of consumption, providing rural households with a 2.5A current limited supply offers attractive cost savings. As consumption in newly electrified rural households is low, providing an electricity supply as low as 2.5A is considered appropriate by Eskom. Such a decision is based on the assumption that rural households need electricity only for applications such as lighting and media. The need for electricity for thermal applications, such as cooking, is assumed not to be required.

While the arguments for implementing current-limited supplies are important from the utility's perspective, it is notably more difficult to determine whether current-limited supplies will be affordable, appropriate and accepted by rural people. Research was undertaken in the 2.5A pilot projects implemented at Tambo in the Eastern Cape and Mafefe in the Northern Province in an attempt to address this issue. Although the project design was not the same in these areas the same principles were applied: a flat rate tariff was charged, and the connection fees were different for different levels of supply in an attempt to provide a signal for poor households to select the 2.5A supply.

There are important criteria against which decisions on current-limited supplies should be made. First, it is vital that we consider the position of the very poor and ensure that no electrification strategy exacerbate the condition of poverty and vulnerability of these households. Secondly, systems of payment must enable rural households to have control over their expenditure on electricity. And finally, where specific electricity services are considered to be beneficial and valued by rural people every effort should be made to deliver these.

Higher-income rural households are able to pay high connection fees

Rural households with relative wealth are clearly not a complicating factor in the discussion on current-limited supplies. Although higher levels of supply are generally required, these households are able to afford and prioritise expenditure on connection fees which are in excess of the standard fee of R75 which is currently charged. Furthermore, as the acquisition of appliances is relatively problem free these households are able to enjoy the benefits of electrification. Bearing this in mind, it is important that an electrification strategy does not aim to provide a current-limited supply of electricity only. Current-limited supplies should be provided as one of a range of supply options. It is critical to acknowledge that rural areas, no matter how 'remote' we imagine them to be, are stratified and we need to develop an electrification strategy which accommodates different needs.

The 2.5A supply is a good electrification strategy for the very poor

The position of other households in rural areas is slightly more complicated. First, it is important to consider the case of the very poor. In the face of the struggle to survive, it is unlikely that the very poor will ever be in a position to enact their desires or fulfil their needs with regard to electricity. The 2.5A supply of electricity is a welcome and important service as it provides the opportunity for improved quality of life, at the very least, through the provision of good quality lighting. However, the research undertaken found that the flat-rate tariff prejudiced very poor people and militated against the sustained use of electricity by the very poor. In fact, the flat-rate tariff resulted either in households being unable to use their electricity supply or in stress on household budgets. Equally important is

the finding that poor households were paying more per month for the same electricity service (for example, lighting) than other households, which were able to pay a higher connection fee for a higher level of supply with a pre-payment meter. Aside from the inherent inequality in this, such a situation can have little impact on improving the conditions of poverty. Furthermore there was a distinct preference for pre-payment meters as they enable people to control their monthly expenditure on electricity. Thus, it is recommended that a 2.5A supply of electricity is supplied with a pre-payment meter.

Some households require electricity for thermal applications

Finally, we need to examine the electricity service needs of rural households which fall between the broad categories of 'very poor' and 'relatively wealthy'. Research has suggested that there are households which are likely to be dissatisfied with what a 2.5A supply of electricity can provide, especially because it does not allow for cooking. From an end-use perspective it seems that the role of electricity in cooking is the critical factor in the decision-making process about current-limited supplies.

It is difficult to quantify the demand for cooking with electricity. However, there are a range of households which already have hotplates, or are saving for them or desire them. Quantitative analysis has shown that one third of households in rural areas use electricity for cooking, often in conjunction with other fuels and although electricity is only likely to be used substantially in higher-income rural households, 10% of low-income rural households do use electricity, albeit with other fuels, for cooking. Qualitative research has shown that electricity was used for cooking far more by waged women.

The critical issue with regard to these households is the 20A connection fee. It was found that the connection fee for higher levels of supply at Tambo (20A) and Mafefe (60A) restricted the number of people opting for them. Although most households could not afford the once-off payment for connection, it is quite feasible that households could manage to pay off the connection fee in instalments. There is a strong tradition of hire-purchase payment for furniture, as well as credit from local shops and spazas. Thus, there are two possible options to enabling households to gain access to higher levels of supply:

- reduce the connection fee for the 20A supply; the amount of R75 is known and accepted;
- charge a higher connection fee of, for example, R200, but allow people to pay the connection fee in instalments over a number of months.

It is important that the cost or method of payment for connection does not force people to select a level of supply which does not provide for all their electricity needs. However, if a 2.5A is supplied to the very poor, it is important that the cost of connection for the 20A is relatively more expensive than the connection fee for 2.5A. This will ensure that those households which will never use electricity for thermal applications will select the 2.5A.

Furthermore, it is imperative that the technical design of electrification projects makes allowance for the need to upgrade. The circumstances and needs of households are not static, and it is essential that, where current-limited supplies are implemented, there is the potential to upgrade – particularly where these limits, such as the 2.5A supply, are very low.

Tariffs and connection fees

It was recommended that policies regarding tariffs and connection fees should adhere to two policy principles, namely affordability and flexibility as well freedom of choice. Specific policy recommendations included the following:

- A variety of tariffs and connection fees, linked to specific supply levels should be available to increase affordability and afford a larger range of choice. The price range

between the various connection fees should be relatively small so that people do not feel trapped in a specific choice.

- There should be a relationship between consumption of electricity and expenditure on the service as well as a link between the perceived benefit of electricity and expenditure. A flat-rate payment system was, therefore, indicated as inappropriate.
- The payment system for connection fees should be flexible and users should be in control of their electricity expenditure.
- Adequate and appropriate information should be available to inform choice.

Non-payment

Regarding the issue of non-payment, four policy principles were identified, namely transparency, flexibility, affordability and consistency.

Specific policy recommendations were as follows:

- Clear, well communicated and flexible procedures regarding disconnection and reconnection procedures should be in place.
- Roles and responsibilities of various stakeholders or role-players should be clearly outlined and communicated to all parties.
- Reconnection fees should be realistic, and not penalise rural people for their poverty.

Level of supply

In terms of the level of supply of electricity to the rural poor, the policy principles of appropriateness and informed choice have been highlighted. Specific policy recommendations include:

- The level of supply should be appropriate for rural households (judged by the households themselves) and contribute to the increased quality of life in rural areas.
- Various options should be available with appropriate measures of up-grading to another level of supply being available to households.
- Adequate and appropriate information should be widely disseminated to enable households to make appropriate choices regarding their required level of supply.

Upgrading requirements

Policy recommendations regarding upgrading requirements should adhere to three policy principles, namely affordability, effectiveness and transparency. Specific policy recommendations include:

- A well managed, transparent system of upgrading to a higher level of supply should be in place.
- Upgrading should be affordable and flexible - for example the required fee should be payable in instalments.

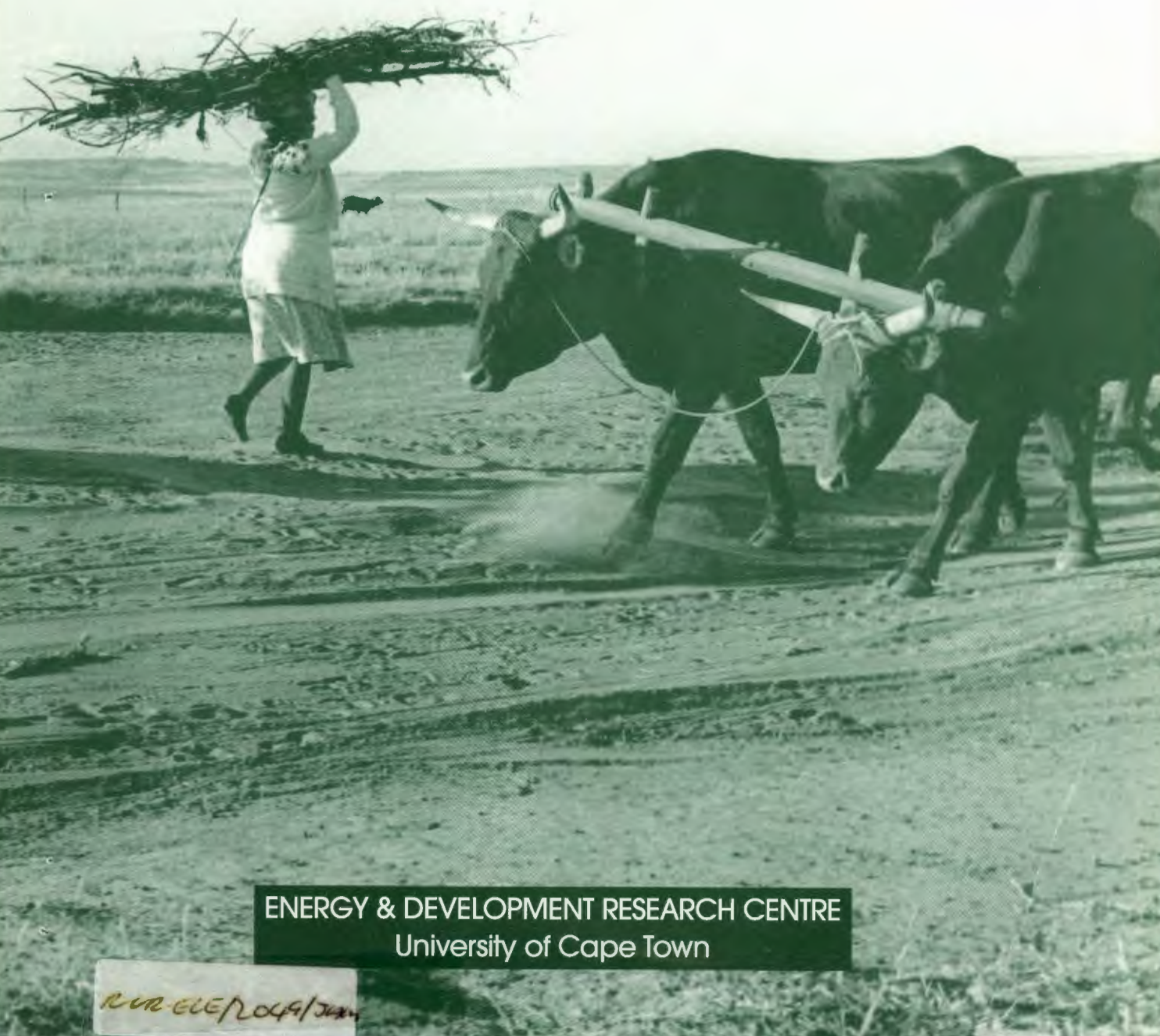
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Current-limited supplies of electricity in the context of South African rural areas

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