

Integrated energy supply in the context of the rural electrification programme

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Introduction

Since 1991 the thrust of energy provision to rural areas in South Africa has been delivery of electricity (grid and off-grid) rather than any other energy service. But, despite the accelerated electrification programme, 73% of the rural population remain unelectrified (NER 1996), and most people continue to use biomass fuels, paraffin and gas for their energy needs. Even those with electricity continue using multiple fuels for thermal applications. The accelerated electrification programme will be completed in 2000, and attention needs to be given to strategies and policies for energy provision to rural areas in the future.

This paper sets out to assess where and how electricity can be put to best use in rural households: which energy services are best provided for by electricity and which needs should be addressed through other interventions. The first section of this paper considers the role of electricity in the provision of energy to rural areas: what it was implicitly assumed that electricity would do and what, in fact, it has contributed. The second section of the paper considers which energy service needs should be addressed through interventions other than electrification, and how this might be done. The paper aims to contribute to the three-year research project: *The role of electricity in the integrated provision of energy in rural areas* (1995–1998) ('the RE project')¹ and to provide an indication of the implications for energy policy, further research and implementation paths to pursue.

Section 1: The role of electricity in the provision of energy to rural areas

To assess the role of electricity in the 'energy lives' of rural people it is necessary to step back and reflect on what it was assumed that electricity could and would contribute to rural areas, and review how many of these assumptions have been validated. Internationally rural electrification (RE) has been charged with the ability to provide a variety of improvements to rural people, from increased income to better health, and South Africa was no different to the rest of the world in what has been called its 'euphoric support' for RE and the benefits it was assumed it would bring (Ranganathan in Davis 1995). In the rest of the world this euphoria was at its zenith in the 1970s and had dissipated by the late 1980s, whereas in South Africa this was just the time that the accelerated electrification programme began and in 1993/4 was given impetus by the ANC's election slogan of 'electricity for all'.

The assumptions about what electrification may achieve are most clearly articulated in the international literature; little such theorisation was offered in South Africa prior to the project. In 1982 Cecelski and Glatt supplied a lengthy list of potential social, health, educational and environmental benefits in which electricity might play a role, as did Ramani in 1992. This paper explores each of these areas in turn, and the validity of each is assessed in the light of the South African context and RE project's findings.¹ International energy experts criticism have been accused of making assumptions about what electricity can accomplish without giving sufficient thought to the conditions of rural people. In reality there is often too little evidence to refute or confirm such assumptions, and so this paper is not conclusive. Current work-in-progress which explores some of the issues may bring more weight to the arguments and is referred to.

¹ Colleen Crawford Cousins has written a detailed paper on 'A question of power: the electrification of rural households', which reviews all the RE project research and reflects creative thinking about current impacts and conditions. This purpose of this summary paper is different.

Before looking at the assumptions, though, it is necessary to make explicit the conceptual framework of the RE project from which standpoint judgments about the role of electricity are made. In particular it is important to indicate very briefly, the project's understanding of *development* and *household* before considering the role of electricity in these.

Development and electrification

The concept of development has been problematised elsewhere (Kabeer 1994; Sachs 1992), and the merits and demerits of the various development approaches, practices and debates are not entered into here, except to say that it has been generally assumed that the provision of electricity would contribute to a preconceived notion of (primarily) economic development. In particular this notion holds that the provision of electricity enables or enhances rural people's ability to generate cash income and become more integrated and active members of the modern consumer society. This assumption is not without foundation, since this is what generally happened when the rural areas of the United States were electrified in the thirties. However, present conditions in the rural areas of South Africa are quite different. Further supporting this disclaimer, Foley (in Davis 1995) points out that list of conditions under which rural electrification may result in net benefits was drawn up by the World Bank in 1975 and is still largely valid; these are that:

- The quality of infrastructure, particularly of roads is reasonably good;
- there is evidence of growth of output from agriculture;
- there is evidence of a growing number of productive uses in farms and agro-industries;
- there are a large number of villages, not too widely scattered;
- income and living standards are improving;
- there are plans for developing the area;
- the region is reasonably close to the main grid (if the demand is particularly strong remote regions may be considered too). (World Bank 1975)

These are not conditions which pertain frequently or even at all in South Africa at present, so the expectation of electricity facilitating economic development should be minimal. Nonetheless, no matter how often this is pointed out, even by World Bank officials themselves (Barnes 1996), utility and government officials continue to seek evidence of the success of electrification in terms of economic development.

The RE project, on the other hand, has been careful to seek ways of understanding the role of electricity in the lives of rural people other than in terms of economic development, and to understand development as an investment in people as well as in infrastructure (James & Ntutela 1997). In terms of this understanding, participation in decision-making about electrification may be an important part of the investment in people which, it is worth noting, is addressed by James (1998). This paper concentrates on the role played by electrification in improving social and environmental conditions at the household level and these are difficult to quantify.

It is also important to note that development is a political process, in which outsiders (the utility, local authorities) have a heavy hand in deciding the allocation of resources – in this case electricity. While a top-down planning process is evident it would be difficult to find a rural villager who did not aspire to having electricity, or who, having received a connection, rejected the idea 'being developed'; thus it is necessary to acknowledge the complexity of the electrification and development processes and note the symbolic value of an electricity connection. Indeed, as Crawford Cousins (1998) writes:

[T]he decision to electrify rural areas is politically highly significant, promising to deliver not only a service but also the perception of development and progress, an election promise made good. Electrical power may be read as the literal alteration of power relations – the materialisation of a reversed resource flow, from richer to poorer South Africans.

Households and electrification

In order to answer the question as to what role electricity plays in rural households, the RE project has had to problematise the notion of a household,² and ask what constitutes a household, how households describe themselves, what relationships obtain between members of a household and, for the purposes of this study, how each person in the household uses and experiences electricity. The primary acknowledgment, which is neither new nor particularly insightful, but nonetheless important, is that there is no simple definition of a household: no simple definition of who lives there, what roles each person fulfills, or what resources they share or contest. While it is clear that the concept of household as a nuclear family headed by a male breadwinner is not typical of rural households, there is, as yet, no neat model to replace it. This makes it difficult to generalise about the role of electricity and constitutes a problem for development planners and policy makers who want to be able to make decisions for large homogenous groups; it is also a challenge for researchers interested in finding other ways of making policy which suits variegated rather than identical models of users.

Case studies, such as those conducted in the RE project, are useful in investigating and understanding something of the micro-level relations in households, and it is primarily from these that the trends in the following sections are drawn. For while there are a multitude of different perceptions of the role of electricity, there are also many common experiences, and the RE project is interested in both. Trying to accommodate the nuances in sensitive policy recommendations is part of the RE project.

Lastly the nature of electricity determines that it must be supplied to an infrastructural point: a school, a clinic, a station, and a house. But the nature of the human relationships, both inside that structure, and with the world outside, will play a large part in determining who uses that electricity, for what and how much. At present much of the policy, planning and implementation has the point of supply in mind rather than the people (Crawford Cousins 1998). The following section tries to describe the role electricity from the users' perspectives.

The suggested benefits of electricity

The following are the benefits which, it is suggested, electricity will contribute to:

- improved living standards;
- improved quality of life;
- reduced burden on women;
- household and community lighting;
- improved communication;
- improved education through lighting;
- improved educational services;
- use of electric pumps;
- lower fertility rates;
- reduced crime;
- alleviated environmental pressures;
- reduced urban migration;

² , The notion of rural was also problematised; see Thom et al (1995) and Crawford Cousins (1998).

- improved urban/rural imbalances;
- improved political stability;
- improved health and safety.

This list was compiled from Davis (1995) from a review of the international literature which makes these potential benefits explicit. To my knowledge no such explicit list has been compiled in South Africa, which means that the assumptions about benefits of electrification exist primarily in the minds of planners (and perhaps recipients) as unexplored, uncritical 'common sense'. For this reason I have chosen to examine item and ask: in terms of the evidence from the studies done in the RE project, does electricity play this role?

It may be that this list is not applicable in South Africa, and that the criteria by which each is judged are not suitable. These are discussed. In most cases we simply do not have sufficient information to make a judgment

1. It is assumed that electrification will play a role in improving living standards and quality of life; is this true?

Probably. The international literature measures improved living standards and quality of life in terms of appliance acquisition and increased income. The RE project would not necessarily agree with this method of assessment – there may be other ways of measuring improved living standards such as less wood-smoke in the dwelling or more time for leisure. Nonetheless, if one were to use appliance acquisition and increased income as criteria there is evidence of the use of electric lights and increased numbers of kettles and hotplates being bought post-electrification (Davis & Ward 1995; Annecke et al 1997).

Because of the low consumption of electricity, many rural electrification studies assume that electricity use would be limited to lights and media, but ownership of a stove or hotplate is more prevalent than previously thought. ~~For example, 80% of electrified homes in Leskop owned a stove, although in some cases it was used only for special occasions (Annecke 1996).~~ On the other hand, candles were still used by 50% of electrified households (Davis & Ward 1995), mainly due to a lack of wiring in rooms other than where the ready-board is placed.

Income and relations outside the immediate household (for example migrant workers who may bring home gadgets) also affect appliance ownership. A point to keep in mind is that electricity often has unequal distributional impacts. That is, households who are marginally better off will be more able to buy appliances and will benefit more than those who cannot.

Increased income as a measure of an improved standard of living is more difficult to assess. Where electricity does substitute for paraffin or candles then cash benefits may accrue. This accrual may be too small to track, and has not yet been attempted.

If quality of life were assessed in terms of well-being rather than appliance acquisition, the symbolic value of electrification may be more important than the number of appliances owned. Of course this would be more difficult to measure empirically, but Crawford Cousins (1998) makes a strong argument for the value of electrification as evidence of personal value in our society, and implicitly, as a contribution to building self-esteem. This may have all sorts of ripple effects and be more important than owning a stove.

2. It is assumed that electrification will play a role in reducing women's domestic burden and save time; is this true?

Not sure. If the assumption is that time and physical effort would be reduced if women did not have to engage in collecting and carrying wood and cooking over fires, then it is true. But if the assumption is that if women did not have to engage in time-consuming wood-fuel collection and cooking over fires they would have more time for productive (read income-generating) activities, then perhaps not, as

the domestic burden is simply shifted from one set of tasks to another. Whether the use of electricity will save time spent on tending fires and cooking depends on whether thermal applications are possible and whether there is the ability to buy appliances. There is insufficient evidence from the case studies to assess how many women have been able to make this substitution. However, in Loskop, women with regular jobs used hotplates to save time because they were busy (and because they were able to afford them).

The evidence gathered shows that, as yet, only a few women have used either the time or money saved by fuel substitution to engage in income-generating activities. For a number of reasons, centred primarily around unfavourable conditions for establishing micro-enterprises and finding markets, income-generating activities resulting from electricity have showed little growth, except that the post-electrification study at Loskop provided evidence of a growing number of refrigerators as time- and labour-saving devices as well as for use by spaza shop owners (Annecke et al 1996).

Although wood collection may continue, other small reductions in effort may be welcomed. For example, the use of electric lighting in all rooms may reduce the domestic burden and save time if paraffin lamps no longer have to be cleaned or filled.

Overall there is a trend towards greater use of electricity, albeit among the marginally higher income households, and presumably this will increase over time (Davis & Ward 1995). Of course, complete substitution of electricity for wood is likely to reduce woman's physical burden, but it should be remembered that the introduction of electric domestic appliances in the UK and Europe did not immediately lead to a reduction in time spent on domestic chores (Living Science Museum, History of electrification display, 1994, Manchester).

This is an area we need to investigate further. Preliminary work done by Annecke (1998) shows perceptions of significant improvement in quality of life, a reduced burden for about 25% of the sample, and a strong belief in reduced burdens for the rest.

3. It is suggested that electricity will be used for household and community lighting, and will allow for 'longer days'; is this true?

Qualified yes. The literature indicates that this is true for South Africa and Botswana (Davis & Ward 1996). But Davis and Ward also point out that 50% of electrified households continue to use candles, at a cost of about R7 a month (1996 rands). This is because only one room is likely to be fitted with an electric light when the connection is made, and there may be several other rooms or several dwellings used at night. Another reason is that households cannot afford, or do not know how, to extend the wiring from one room to another, and Mehlwana and Qase (1997) record the inconvenience of no bedside light in urban areas, which presumably would hold for rural areas too. A single light-fitting limits the role of electricity to being useful in one room only, but there is no evidence that electric lighting is (or is not) needed for any other evening work.

The effect of 'longer days' is uncertain. Cecelski (in Davis 1992) and others have pointed out that extending the day and women's working hours is not necessarily healthy or conducive to an improved quality of life. Annecke's work in progress (1998) shows benefits of longer days to about 30% of households, primarily those who have children or have the means to engage in income generating activities.

4. It is assumed that electricity will improve communication; is this true?

Uncertain. Preliminary questions at Morrison's Post (Van Gass 1996) revealed that non-electrified households expected that electricity would make a qualitative difference to staying in touch with relatives and the world, that the number of telephones, televisions and radios would increase. This belief is somewhat contradicted by Annecke et al's (1996) finding that the number of televisions at

Loskop had not increased dramatically and that those in place were generally powered by batteries or generators. Most households owned battery-operated radios before electrification and, since these were not convertible to electricity, electrification has probably not made much impact on radio listenership.

Electrification does not improve communication through improved transport.

5. It is assumed that electricity will lead to improved education through providing lighting for evening study for school children and adult learners alike; is this true?

Uncertain, towards positive. Kloot (1998) found that where off-grid electrification of schools has taken place, schoolchildren reported using classrooms at the school at night for studying. Little has yet been done to monitor adult education night classes, or children studying at home, although Annecke's work in progress (1998) shows use of electrified class rooms at night for matriculants to work in, and a belief that better lighting facilitates school work at night.

Whether electricity will contribute to improved education also depends on whether there is an ethos of homework and learning, whether night classes are available, whether there is anything to read, whether people watch television, listen to educational programmes and what they gain from either.

6. It is suggested that electricity will play a role in improving education and educational services; is this true?

Uncertain. Electricity on its own cannot automatically offer these benefits. If there are the teachers and the facilities necessary (water, laboratories, workshops, audio-visual equipment) then electricity may play a useful role in extending the learning experience. There is some evidence of this happening (Gordon 1997). However, the more common experience appears to be that either the electricity supply is faulty or the equipment and teacher-skill is lacking (Bedford 1997), and electricity has added little to an already over-burdened system.

Educational radio and television services have done their own evaluation of the impact of their programmes, and this appears to be positive (Naidoo 1998), but the contribution of electricity (as opposed to batteries or generators) has not yet been evaluated. In terms of non-formal and self-education, it has been argued that access to media can play a powerful role; Bedford (1997) reports that a school which had equipped itself with a generator-operated television was one of the more successful.

While on the one hand it would appear that education and electricity are complementary nowadays, and the desire for human development includes the ability to participate in the modern world through television and computers, on the other hand the reality is that many schools still lack water, toilets, good teachers and the ability to pay electricity or any other bills. Many obstacles stand between rural people and education – and a lack of electricity is just one of them.

7. It is suggested that electricity will play a role in lowering fertility rates; is this true?

Lowering fertility rates is a complex matter and research shows it is more likely to be related to multiple factors such as increased standard of living, education and income rather than just one factor such as electricity. Although a direct correlation is unlikely between electrification and lower birth rates, family spacing and health messages (among others) may be conveyed on television and radio, and it may be that electricity facilitates the spreading of the messages.

8. It is assumed that electricity will contribute to reducing crime rates; is this true?

Yes, it would appear so. Although there are no published statistics to link a decrease in crime to electrification, anecdotal evidence is that electric lights constrain criminal activity, and provide greater safety especially for women to move around at night. James and Ntutela (1997) found that residents at Tambo

fitted outside lights for safety. Annecke (1998) found unanimous and enthusiastic endorsement for outside lights, men and women believing that they enhanced safety.

Eskom has no policy of street lighting in rural areas.

9. It is suggested that electrification will have environmental benefits, such as alleviating the pressure on local fuelwood; is this true?

Uncertain. The accelerated electrification programme has not been targeted specifically at wood-scarce areas. The grid has been extended to villages closest to the spine, which means that these villages are rarely remote and in many cases are likely to be supplied with paraffin, perhaps gas, and have a source of wood. In remote areas where off-grid has been supplied, wood and paraffin are still used for thermal applications so it is unlikely that there has been much alleviation of the use of wood. It may be that in some areas to which the grid has been extended electricity will begin to replace wood, but this has not been evaluated. Without such an evaluation this question cannot be answered.

International literature is of the opinion that there is not much relief to fuelwood from electricity because factors other than domestic wood collection cause deforestation. It is my opinion that the substitution of paraffin or electricity for thermal applications may well alleviate pressure on fuelwood. The question is whether this substitution will happen. Both Davis and Ward (1995) and Afrane-Okese (1998) show that (presuming it is available) the use of electricity for heating and cooking is closely linked to income. So one way of answering this question would be in the affirmative if income levels rise. In the current economic climate this seems unlikely.

Another way of addressing the question is a reminder that both coal-fired electricity and paraffin imply a different set of environmental problems which should be taken into account when advocating their use, and that managed (sustainable) woodfuel use for thermal applications and electricity for others may be ideal.

This is another area which deserves further research.

10. It is suggested that electrification will play a role in reducing urban migration; is this true?

Uncertain but unlikely. Employment, or at least perceived income-generation opportunities which have not yet been seen to be stimulated by electricity provision, are the deciding factor in rural-urban migration. Thus electrification *per se* is unlikely to stem the tide of urbanisation. Cecelski (1996) suggests that familiarity with urban culture through the media may encourage the rural-urban movement. On the other hand Crawford Cousins (1998) argues that '[h]ousehold electrification may be one of a package of services and new entitlements which may encourage long term social investment in rural stability'. Stability being a much sought-after condition in South Africa, she strengthens her argument by quoting Spiegal:

Given secure access to agrarian resources, many migrants have reckoned that their basic reproductive costs can be greatly reduced, with their rural base providing a 'safety net' for times of unemployment, ill-health and retirement. For that reason they continue to remit and use their incomes to fashion rural homes and networks.

Thus the circular migration continues: people leave rural area to earn incomes which they partially invest in rural areas.

As home-ownership and land tenure patterns change, these patterns may shift too. But urbanisation need not be seen as a negative. Both French and new African literature on cities sees urbanisation in a positive light (Freund 1997).

11. It is suggested that electrification will play a role in addressing urban/rural imbalances; is this true?

Yes. Electricity is perceived as bringing the advantages of urban life closer to rural people. Kloot's (1997) energisation study shows rural people's desire for 'development' as it is happening in the urban areas, including electrification. It is commonly believed that electricity will make life easier, television more possible and bring sophistication within the reach of rural people. The case studies have also shown that the provision of electricity may make it easier to retain doctors, nurses (Ross et al 1997) and teachers (Annecke 1998; Kloot, 1997) in rural areas, and make it less arduous for family from urban areas to 'go home'.

13. It is suggested that electrification will play a role in the political stability and security of rural communities; is this true?

Uncertain. With the 1999 elections looming it would be interesting, but almost impossible, to investigate the degree of satisfaction and political stability afforded by the delivery of grid and off-grid electricity. Certainly the accelerated programme has delivered in terms of meeting the connection targets set by the Reconstruction and Development Programme. In terms of local politics, electrification has sometimes been the cause of instability and conflict as neighbouring villages or local chiefs have vied to be electrified first.

If Crawford Cousins is correct about electrification contributing to a package of services conducive to rural investment, which seems feasible, then electricity's role is a positive one. In addition, Crawford Cousins argues that the act of being connected to the grid is symbolic of one's importance in the nation and would engender a 'politics of hope' – important to historically impoverished areas.

14. It is suggested that electrification will play a role in promoting health and safety; is this true?

Qualified yes. The links between electricity and health services, and electricity and household health are becoming clearer. What is clear is that over the long term electrification can have both direct and indirect health benefits, particularly when implemented as part of a co-ordinated strategy for rural development (Ross et al 1997). Crawford Cousins (1998) argues that the assumptions about health and electricity are that electricity will:

- reduce domestic air pollution and produce a concomitant reduction in Acute Respiratory Infections (electrification will enable people to cook and heat their houses);
- reduce accidents of fire and explosion caused by candles and hydro-carbon appliances;
- reduce cooking time and increase nutritional value;
- allow food to be safely stored (refrigeration);
- promote health through educational radio and television;
- give better quality of light – promoting reading and learning and, indirectly, well-being through literacy;
- reduce fertility rates.

These contributions are acknowledged to be important but limited and, rather than dwelling on the above practicalities, Crawford Cousins shifts the focus to looking at the contribution of electricity to the well-being of the rural poor: their physical and mental health, self-esteem, status at household, community and national level, and the health of the children. These are difficult qualities to measure, but nonetheless important, and this notion of well-being forms the basis of the World Health Organisation's definition of health as 'a state of complete mental, physical and social well-being' (in Crawford Cousins 1998). Health is understood not as a product or a package but a process which people need to engage in and take charge of, but they cannot do this without sufficient access to

power and resources. These resources may be as basic as enough good food (and fuel to cook it) and clean water, and the power to insist on these. Contrary to the notion of pastoral bliss, the mental health of very poor rural people may be compromised by the sheer stress of day-to-day survival.

At the practical level the immediate dangers of paraffin and biomass use are real. Fatal burns, paraffin poisoning and respiratory illnesses are common hazards. The consequences for women and children of collecting wood – back and neck injury, and acute fatigue – would diminish dramatically with a full transition to electricity. This, however, will take time (Davis & Ward 1995), and mitigating the unsafe aspects of wood and paraffin may be a short-term solution.

Household health is also dependent on effective emergency health care: distance from the secondary hospital, transport and communications. This is especially true with regard to reproduction, pregnancy, abortion, miscarriage and childbirth, which are still responsible for too many rural women's deaths. With respect to these health issues, electricity for telephones and education may make some impact on household health.

Is the role of electricity all positive?

An assessment of the role of electrification in the provision of energy to rural areas cannot be complete without mentioning its potential negative roles. Once again, as with the positive aspects above, it is not the moving electrons as such, but the ways they are put to use, that result in improvements or otherwise. The possible problems have not been consistently studied (because they seem fairly trivial in the face of the popular demand for electricity) so that this is a somewhat arbitrary list.

Crawford Cousins (1998) mentions the dangers of hire purchase schemes which demand regular payment regardless of fluctuating household fortunes, so that expenditure on bills may take precedence over basic needs, as well as the dangers of shocks or electrocution when people do their own wiring.

James (1997) notes the possible burden which regular or flat rate payments put on the budget. She also notes that the full benefits of electricity cannot be enjoyed where the electricity connection is in the same space as the entertainment area and cultural or gender relations do not permit cooking and entertaining in the same space. In this case the women invariably ends up cooking outside.

Mehlwana and Qase (1996) point out that in urban areas electricity reduces certain community links that develop through sharing fuel resources.

In summary

Electricity will play a role in:

Improved living standards	Qualified yes
Improved quality of life	Yes or a qualified yes
Reduced domestic burden for women	Uncertain, likely for some
Time saving	Uncertain
Improved communication	Uncertain
Lighting for 'longer days'	Qualified yes
Improved education through providing lighting for evening study for school children and adult learners alike	Uncertain, towards positive
Improved educational facilities and audio-visual aids	Uncertain
Lowered fertility rates	Uncertain
Reduced crime rates/ improved safety	Yes

Environmental benefits, such as alleviating the pressure on local fuelwood	Uncertain, dependent on income
Reduced urban migration	Uncertain, unlikely
Improved political stability and security of rural communities	Uncertain
Improved health and safety	Qualified yes

Since there is little evidence to the contrary, we can intuitively accept that electricity does play a role in all these dimensions of life, but, as is clear from the matrix above, we do not really know what role this is. At least, more accurately and importantly, it is difficult to quantify. However, the contribution of electricity in all categories except reduced urban migration has positive potential and James (1998) argues for community involvement in the electrification process so that RE's contribution to human development should go beyond electricity.

The question, then, is not whether electricity plays the expected role, but when and how electricity is best suited to playing this role, and whether other energy services would suffice or would do it better. If we took the list again and asked which of these functions are best served by electricity, it would appear that electricity provides cheap and safe lighting and media applications but under present conditions is not used to address arguably the most important energy needs: those for thermal applications. Clearly these need to be addressed most urgently and then optimal use should be made of electricity as far as its use value in the other categories has been proved. For instance, creative ways of making thermal applications possible is important and should be explored, including communal cooking facilities and low-current stoves. More lights are clearly needed inside dwellings and a utility capable of designing pebble-bed reactors should be capable of solving this problem in affordable ways to its benefit and to that of local entrepreneurs. Streetlights are required for community safety. The usefulness of electricity in reducing women's domestic burden and affording them time to engage in leisure activities, attend meetings or classes or work co-operatively at each others' houses, is negated unless they feel safe outside. Solar-powered streetlights, perhaps from the school's system where there is one, are a possibility, so that women do not remain housebound at night. It would appear that greater use of electricity could be made if cheap adapters for radios were available, or if there were schemes to encourage replacing battery-powered radios with mains-powered ones, and cheaper televisions.

Poverty remains a barrier to electricity use. At present, because of the combined cost of connections, wiring and appliances, using electricity does not reduce spending – in fact it may increase it – and because the cost of women's labour is unaccounted for, cooking with electricity is still more expensive in financial terms than with wood. In addition, while RE's impact may be low in many of the areas in the matrix above, it is also possible that the benefits might not accrue by themselves, and there may be a requirement for an institutional mechanism to facilitate these benefits, by way of awareness creation, working towards developing other infrastructure. This could be a role for NGOs or other local organisations.

Section 2 : An integrated approach

The purpose of an integrated approach would be to maximise the benefits of rural electrification for lighting and media, while recognising its limited potential in current conditions to meet important thermal needs and paying attention to the provision of biomass and hydro-carbon fuels to meet these and other energy needs.

This is easier said than done. Gandar (1990), Loon (1996) and Afrane-Okese (1998) have provided eloquent arguments and strategies for achieving integrated energy planning (IEP) and provision, and there is no doubt within the RE project that greater emphasis should be placed on integrated strategies to address rural energy needs and choices. But there are a number of obstacles to achieving this. First of all there is no policy in place to facilitate or compel such integration. Indeed, within the Department of Minerals and Energy the energy sub-sectors are treated quite separately and situated in different directorates. Coal-mining, electricity and petroleum are the most important to the macro-economy and traditionally receive the most attention. Although under the new government the emphasis has shifted from the maintenance of strategic fuel reserves to the restructuring of the petroleum industry and electricity supply industry, energy for the poor still receives minimal research and development funding. There is, however, a newly established Demand and Non-Grid Electrification Directorate which should be encouraged to take up integrated energy planning and provision. This would include horizontal integration of household energy technologies such as energy-efficient stoves and vertical integration to improve the participation of all stakeholders (Manhlazi 1998).

At a national level, integrated provision would mean co-operation between energy sub-sectors and between departments. For example, at present there is not an accurate holistic picture of where energy poverty is most severe, but it is likely to be those areas in which fuelwood is scarce and incomes are very low. Although it is clear that fuelwood is going to be in demand for cooking and space-heating for some years to come, ensuring a supply may be a problem in some areas. These should be identified and mapped on GIS systems which includes resources such as water and forestry in adjacent areas. Social forestry is a resource management tool rather than an energy strategy, but is a good example of an activity which requires inter-sectoral co-operation. The Department of Water Affairs and Forestry has the responsibility of implementing the social forestry programme but the DME needs to take a lively interest and an active role in the by-products and how these are distributed and used.

Paraffin is used by 82% of all rural households (Davis & Ward 1995) and warrants greater attention than it currently receives. Informal distribution systems work relatively well, but the cost to the consumer is far higher than it could be, particularly in rural areas. Ensuring bulk supplies to depots in rural areas may be one way of containing prices; another would be to make paraffin VAT zero-rated. But both the DME and the Department of Finance have not given this proposal serious consideration. These rural 'energy depots' could be used as supply points for LPG and wood offcuts as well as low-smoke coal. Co-operation would also be required at local level, to facilitate suppliers finding collaborative solutions such as transport sharing and co-operate to their and the customers' benefit in the interests of developing rural areas as an investment in the economic well-being of the nation.

In terms of air quality and safety in using paraffin and fuelwood, co-operative action is needed between the DME, NGOs CBOs and designers of stoves and chimneys to reduce dependence on smoky and dangerous fires, reduce indoor pollution, and ensure safe paraffin appliances. This would require a lead from the DME and co-operation with the South African Bureau of Standards. The DME does have a low-smoke coal programme in place, but its acceptability and affordability have yet to be proved.

Loon (1996: 97) points out that that there has been official recognition of the problems of energy services in rural areas, and these are addressed in the RDP's document on Rural Development Strategy which suggests the following:

- A rural electrification drive, including both grid and off-grid connections, for all types of users.

- Policies to secure fuelwood supplies, including social forestry and woodlot programmes, the redistribution of wood from surplus areas, the management of natural woodlot harvesting and endeavours to improve efficiency of wood use.
- Options to improve access to petroleum fuels, including reducing the size of diesel bulk supply containers, granting fuels like paraffin a zero VAT rating, and improving the packaging and distribution networks of paraffin and LPG.
- The development of rural service centres, which would provide information and advice on energy use, sell energy-related goods such as appliances and cards, and provide repair services to appliances and equipment.
- Policies that would address rural energy issues such as those dealing with the health and environmental impact of coal use, thermal efficiency of housing, financial assistance for equipment and bulk buying and improved dissemination of solar water pumps.
- Short-to-medium-term subsidisation for certain initiatives such as woodlots and electrical connections.

Some of the above are being addressed. In addition the possibilities of new and renewable energy being used to solve the energy needs of rural communities are being explored in small-scale pilot projects in Gauteng and the Western Cape (solar water heaters), and the Northern Province and KwaZulu-Natal where solar home systems are being installed. But the cost and acceptability of the technology has still to be tested. Whereas grid connections are subsidised, financing expensive off-grid technologies remains a problem. An interesting experiment, promoted as an integrated energy package, is being piloted by Eskom in KwaBaza (Kloot 1997): gas for thermal applications is being put together with the installation of PV for lighting and media. The package will cost the consumer about R85 per month, which will include a gas refill. One of the limitations of the project is the limited choice offered by the package, but it is a pilot project worth watching. Another is an ambitious solar and gas scheme being piloted by the DME and the Bavarian government at Folovhodwe in the Northern province.

A question raised by the KwaBaza pilot is how people make informed choices and how and what energy information can be conveyed in mass meetings or easily accessible printed material. Initiatives such as the Soul City educational programme and the Energy Agents project which offer creative solutions to the dissemination of energy information need to be supported at national and provincial levels. One way to ensure this is by constant meetings with officials. This is a time-consuming and expensive part of applied research. The ability of all energy users to make an informed choice should be a goal of the DME in collaboration with its research and education partners.

Conclusion

Energy policy for the rural poor should facilitate informed choice and safety in selection from a wide range of options. This would mean understanding demand as well as supply and a strong lead from the DME in integrated provision to facilitate collaboration rather than competition between the energy sub-sectors. It would mean focusing on improvements in paraffin and gas and wood use while not neglecting electricity.

A strong recommendation is that RE plans should be integrated development plans. Such a process would entail a major reorientation in institutional arrangements and structures and is the subject of an EDRC research project 1998/99 towards a major policy exercise. The implications for integration at policy level, strategy level, programmatic and institutional level will be investigated in this study. Tapson (1997) suggests that for a start liaison between regional development planning managers should be built into job descriptions rather than left to negotiations at Development Forum meetings.

The tangible benefits of rural electrification are difficult to quantify and need further investigation to ensure the relevance of a continued electrification programme. One thing is clear: electricity, unless it were to be supplied free of charge with the necessary accompanying appliances, cannot solve the energy problems of the poor. This is essentially because the poor do not have the cash or credit facilities to pay for the infrastructure, the electricity, the wiring or the appliances. As this realisation dawns it may be used as a reason to halt the electrification programme. This would be morally wrong. While electricity does not offer the desired panacea, it does offer benefits at the household level. While it does not in or of itself 'create' development, or improve household wellbeing, it can contribute to both (Annecke 1998). Universal lighting is a priority and the option of cooking relieves the burden of wood collection for some.

On the other hand, attention must be paid to wood supply for cooking, and fuel-efficient stoves and techniques, as well as ways to offer paraffin at lower prices and in safer cooking appliances. Possibilities for greater gas use are being explored, but renewables have yet to receive the attention or research and development funding that they deserve.

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WENDY ANNECKE

