Issue 1

Energy Use to Reduce Poverty - Final Report for Phase 1: (R8020)

A report produced for Department for International Development

October 2004

Issue 1

Energy Use to Reduce Poverty – Final Report for Phase 1: (R8020)

A report produced for Department for International Development

This report was prepared by Future Energy Solutions (AEAT) with contributions from:
Wendy Annecke, Independent Consultant, South Africa.
Mark Borchers, Sustainable Energy Africa, South Africa.
Bill Rigby, Voice International, Uganda.
Delius Asiimwe, Makerere Institute of Social Research, Uganda.

This document is an output from a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of the DFID.

October 2004

Title	Energy Use to Reduce Poverty – Final Report for Phase 1
Customer	Department for International Development
Customer reference	R8020
Confidentiality, copyright and reproduction	This document has been prepared by AEA Technology plc in connection with a contract to supply goods and/or services and is submitted only on the basis of strict confidentiality. The contents must not be disclosed to third parties other than in accordance with the terms of the contract.
File reference	fes/projects/international/dfid Kar projects/enpov/final report
Report number	ED01282/Phase 1
Report status	Issue 2

Future Energy Solutions
AEA Technology Environment
Harwell, Didcot,
OXON, OX11 OQJ.

Telephone +44(0)870 190 6104
Facsimile +44(0)870 190 6328

AEA Technology is the trading name of AEA Technology plc
AEA Technology is certificated to BS EN ISO9001:(1994)

	Name	**Signature**	**Date**
Authors	Clare Downing Jacqui Grant Denise Oakley		
Reviewed by	Alison Bannister		
Approved by	Tom Slesenger		

Executive Summary

PROJECT PURPOSE AND OBJECTIVE

The project purpose is to advance the understanding of energy use by the poor by identifying potential linkages between energy and poverty, particularly in MDG and cross cutting areas.

The objective is to develop peer reviewed methodologies that will allow researchers to collect quantitative data in the areas of gender-energy-poverty and education-energy-poverty. This may assist with informing the design of policies and programmes across these development sectors in terms of how access to and use of modern fuels can reduce poverty.

The outputs from the project are:

- A network of key players across a variety of sectors and disciplines who are interested in developing this field
- A critique of research to date on linkages
- Initial methodologies for gender and education sectors that could generate robust quantitative evidence for the linkages and
- Recommendations for further work.

The work was divided into Phase 1 task1 and Phase 1 tasks 2-5. The first 2 outputs were achieved within Phase 1 task 1 and were reported in 'R8020: Energy to Reduce Poverty (phase 1-1)' report in August 2003. The second two outputs were achieved within Phase 1 tasks 2-5 and are the subject of this report.

PHASE 1 TASK 1

The approach taken was to:

- Identify poverty and Millennium Development Goal (MDG) area specialists
- Work with specialists to identify linkages between energy and the health, environment, education and gender sectors,
- Identify a research approach that could fill some of the gaps in information
- Make recommendations on which research gaps should be taken forward.

The network of contacts is presented in Appendix 4 of the Phase 1-1 report.

Evidence for linkages

The critique of research showed that the strongest quantitative evidence was found between health and energy (particularly in relation to indoor air pollution). Despite numerous papers highlighting the importance and range of potential linkages, empirical evidence was weakest between energy/poverty and environment, gender and education.

Research approach

Both researchers and donors questioned a focus solely on quantitative evidence.

IDS suggested that *'the most powerful (poverty) studies nest good participatory work within a wider population of which more clear cut facts are known – for instance*

nationally representative household surveys combined with participatory poverty assessments'.

Recommendations
The gender and education sectors were especially limited in terms of quantitative evidence and hence further study of these two areas was recommended.

This work is summarised in section 1.2 within this report and described in full in the Phase 1-1 report.

PHASE 1 TASKS 2-5

The objective was to develop methodologies for the gender and education sectors that could generate robust quantitative evidence on linkages with energy and poverty, and to provide recommendations for further work.

The approach taken for each sector (gender and education) in Phase 1 tasks 2-5 was:

- A country-specific literature review and stakeholder consultation to assist with determining the research hypothesis
- The development of a methodology (guidance and questionnaire)
- Limited pilot testing and peer-review workshop to refine the methodology
- Recommendations for further work.

Sections 2 and 3 of this report describe the approach in more detail for gender and education respectively. Section 4 summarises the dissemination activities undertaken, Section 5 provides the conclusions from this work and Section 6 looks forward with recommendations for future work. The final methodologies are provided in Appendix E.

GENDER-ENERGY-POVERTY

Introduction

Gender equality is now a core element of the strategy to reduce global poverty, and the framework for poverty reduction has been considerably expanded through the inclusion of the additional gender issues of security, opportunity, and empowerment[1].

The importance of gaining a greater understanding of the gender-energy-poverty nexus has now been recognised. The specification of target dates for achieving the MDGs and the increased emphasis on quantitative analysis requires methodologies for data collection and the monitoring of progress. Measuring changes in gender equality requires work in areas that are sensitive, multi-faceted and inter-linked, and is made more difficult when a third dimension, such as energy, is added.

Literature review and stakeholder consultation

A country specific review was undertaken to determine:

1 See World Development Report 2000 / 2001: 'Attacking Poverty'

- The extent to which quantitative gender-energy studies have been undertaken in South Africa and
- Whether any questionnaires that have been used could be made available.

Our literature review confirmed that although qualitative studies have been undertaken in this area in South Africa, there are few, if any, **quantitative** studies on gender-energy-poverty linkages. The lack of available methodologies for quantitative data gathering has limited the information available to policy-makers, particularly in regard to the provision of modern energy services to poor communities.

A stakeholder consultation was carried out to identify specific areas within the gender-energy-poverty nexus where policy makers and development specialists believe data is required to underpin future policy directions and resource allocations.

The key conclusion from the stakeholder consultation was that cooking and most household chores are an area that remains firmly in the women's domain, and absorbs a substantial amount of time (and often human energy).

Developing the Methodology

Based on the review and interviews, the research hypothesis was formulated:

'Electricity improves women's life regarding cooking and their other chores in the household'

The focus of the field test for methodology development was formal, low-income, electrified (over the last 8 years) households in an urban setting,

The field test, although only limited (25 households), confirmed standard good practice lessons including:

- Good initial community engagement is essential.
- It is important to ensure that researchers and interviewers share understanding of energy terminology.
- A limited test (5-10 households) of the methodology should be undertaken prior to conducting any full survey. This provides an opportunity for the researchers to evaluate the respondents understanding of the wording and intention of each question, observe body language and collect verbal responses for collation and comparison.
- Questions concerned with income e.g. sources and amounts from employment, business turnover and surplus, social welfare payments, etc) and expenditure should be positioned towards the end of the questionnaire, as these are sensitive questions and require a rapport to be developed between researcher and respondent.

The refined questionnaire (see Appendix E1) arising from the field test, extensive stakeholder consultation and peer review provides a valuable tool for future research.

EDUCATION-ENERGY-POVERTY

Introduction

The attainment of universal primary level education for all by 2015 is a central aim of the Millennium Development Goals, and continues to be the number one education priority within the international community.

There is recognition that linkages between energy and education do exist however, the extent and magnitude of these links are not known. Specific research was therefore undertaken to develop a suitable methodology to investigate the possible linkages and provide evidence of their impact. Uganda was selected for the field research based on its current development activities and policies regarding education, poverty and energy.

Global Literature review

A global literature review was undertaken to find evidence of the linkages between energy, poverty and education, with emphasis on modern energy, and electricity in particular. Though some successful cases cited benefits such as prolonged hours working through the provision of lighting, and relief in the domestic burden of girls to enable longer study time, there remains scepticism amongst educationalists that do not perceive access to energy services as an education priority. The key conclusion from the literature review was that no quantitative evidence was found.

Country-specific literature review and stakeholder consultation

In order to narrow the scope of the global research, a country-specific review and stakeholder consultation was carried out in Uganda. The results show that there is no record of research or primary data in Uganda that relates to linkages between energy, education and poverty. No evidence on which to directly measure the impacts of energy services on educational attainment was identified although, the value of both education and energy services was widely recognised. The possibility that linkages between energy and education could exist is clearly acknowledged and as a result has been reflected in the current government programmes.

Methodology development

Research Hypothesis

Based on the review and stakeholder consultation, the hypothesis was:

'How does access to modern energy services in community primary schools impact on education?'

Analytical Framework

The analytical framework is based on two elements of the Sustainable Livelihoods model – human and social capital. Within this context, education is the main component of human capital and traditional quantitative literature on human capital concentrates primarily on rates of return to schooling. Social capital in this context relates to the norms and networks that facilitate joint and other collaborative community based actions and results in enhancement of community (and by extension, individual) well-being.

A series of core questions focused on the school and community underpinned the research framework. The resulting questionnaire (containing both quantitative and qualitative questions) focused on potential impacts on energy services related to access, quality and equity. The methodology enables data to be collected on a number of important impact indicators including: Teacher retention; Educational attainment of pupils; Curriculum development; ICT development in schools; Services (e.g. evening classes) provided by the community; Literacy rates; Timing of teaching, Lesson preparation and marking, and Hours of study.

The refined methodology (see Appendix E2.1) and Uganda specific questionnaire (see Appendix E2.4) are valuable tools that can be used in future field research to generate robust evidence and understanding of education-energy-poverty linkages.

CONCLUSIONS AND RECOMMENDATIONS

Linkages between complex issues, such as gender or education, with energy and poverty are not direct.
In many cases, there is an assumed link but this has not been proven. If energy is introduced as a third element, the potential for additional direct and indirect linkages between pairs further increases with a consequential increase in the complexity of the research hypothesis.

The presence of multiple, inter-related linkages needs to be reflected in the approach and content of a methodology to explore linkages with energy and poverty.
A purely quantitative methodology cannot adequately explore and represent the complexity of linkages involving multi-faceted elements such as education, gender and poverty. Hence both methodologies contain two types of questions - those designed to extract data (quantitative) and those designed to gain a deeper understanding of the reasons behind the quantitative findings. This means that the researchers can examine why and how any observed changes have been brought about, as well as the precise nature of the change that has occurred and whether this is positive or negative (qualitative). This contributes to increasing the effectiveness of policy responses on the energy-poverty nexus and it is therefore recommended that future research in these areas should incorporate both quantitative and qualitative analysis.

The methodology needs to be embedded within a suitable analytical framework.
For a methodology to be effective in exploring complex linkages, quantitative and qualitative elements must be combined within a suitable analytical framework. This study (education-energy-poverty component) has shown that elements of the sustainable livelihoods framework can be used as a tool to conceptualise key points where linkages between any 2 or all 3 elements may exist. The gender component of the study used a stakeholder consultation to identify the key areas of the Gender-Energy nexus (in South Africa) where data and an improved understanding were required. Both approaches enabled the selection of one research hypothesis around which the methodology could be developed, and to act as a lens through which to quantify and explore a wide range of issues / sub-linkages. In each case, the process of developing the methodology led to the expansion of originally quantitative questions into combined quantitative / qualitative questions.

Involvement of stakeholders, research specialists and community researchers during the process.
The development of a contextually appropriate survey and participatory methodology must involve stakeholders, research specialists and community researchers at several stages during the process. The participatory approach used in both components of this study comprised a focused literature review undertaken by experts in the field / country, definition of a contextually relevant research hypothesis (with the assistance of key stakeholders), development of an initial methodology (including community testing of individual questions), community pilot testing of the methodology and a review workshop. It is also essential that the methodologies be adapted to suit local contexts, that field researchers are highly familiar with the environment and that the research is undertaken with the visible support of the local community leaders (and other 'gatekeepers'). The continual participatory nature of the approach was highly effective in the development and refinement of a combined quantitative / qualitative methodology for exploring gender-energy-poverty linkages and education-energy-poverty linkages.

Advisory Committees and Thematic Workshops to maintain momentum
Global advisory committees comprising the key stakeholders responsible for linking education-energy-poverty and gender-energy-poverty objectives should be established in order that synergies between the studies and complementary policies can be designed and implemented. It is recommended that thematic (gender / education) workshops are held to transfer the methodologies, findings and lessons learned to researchers in these fields (particularly those involved in current DFID KaR projects).

Although the objective of this research was process oriented i.e. to develop methodologies, there are some tentative findings from the small sample on which the methodology was tested. These are not necessarily representative and should be treated with caution.

Gender specific conclusions and recommendations (from work in South Africa) (For full details see sections 2.5 and Appendix B3)

- There is a lack of research on gender-energy-poverty issues in poor households
- The gender landscape needs to be constantly monitored
- The gender landscape in South Africa is changing
- Participation of men is an essential element of the research
- Affordability and day-to-day accessibility of electricity remain issues in poor communities where personal security may be problematic (particularly after dark)
- Paraffin is widely used for space heating in electrified homes
- There is a higher than expected level of electrical appliance ownership
- There is no gender bias regarding decision-making around electricity / fuel purchase and appliance acquisition
- Cooking is not considered a burden by many of the women interviewed.
- Continued research is needed to address practical gender needs.

Education specific conclusions and recommendations (from work in Uganda) (For full details see sections 3.4 and Appendix C2)

- There is general awareness of the possible benefits of energy services to education
- It is helpful to embed the development of the methodology and interpretation of the findings in a suitable framework, such as Sustainable Livelihoods
- Guidance on energy terminology for interviewers is critical. The USAID Energy Toolkit for journalists might offer a suitable source of briefing material.
- It is important to incorporate an element of household level analysis in the methodology as well as looking at the school level.
- Continued collaboration between key stakeholders (education specialists, ministries and research specialists) will provide synergy and influence at the policy level
- Additional research is needed to input into national cross-sectoral implementation strategies within Uganda.

The expanded conclusions and recommendations from the gender and education components are provided Sections 5 and 6 of this report.

Contents

EXECUTIVE SUMMARY I

1 INTRODUCTION 4

1.1 Project purpose and objective 4

1.2 Phase 1 Task 1 4
1.2.1. Extent of Quantitative Evidence to support these linkages 4
1.2.2. Methodologies for exploring the linkages 5
1.2.3. Related to the Process of the Study 6
1.2.4. Conclusions 7
1.2.5. Recommendations 7

1.3 Phase 1 Tasks 2-5 7
1.3.1 Objectives 7
1.3.2 Approach 8

2 GENDER-ENERGY-POVERTY LINKAGES 8

2.1 Introduction 8
2.1.1 Gender issues – a growing awareness 8
2.1.2 Gender-energy-poverty linkages 9

2.2 Factors Impacting on the Implementation of the Research 10
2.2.1 Country Selection 10
2.2.2 Complexity of Subject Area 10
2.2.3 Quantitative versus Qualitative 10

2.3 Literature Review and stakeholder consultation – South Africa 10
2.3.1 Literature review 10
2.3.2 Stakeholder Consultation 12

2.4 Development of Methodology 12
2.4.1 Methodology Approach 12
2.4.2 Steps in Developing the Methodology 13
2.4.2.1 Definition of the research hypothesis 13
2.4.2.2 The target group and sample selection 14
2.4.2.3 Statistical validity of survey 14
2.4.2.4 Development and testing of the detailed methodology 14
2.4.2.5 Finalisation of the Methodology 18

2.5 Initial Findings 22

3 EDUCATION–ENERGY-POVERTY LINKAGES 25

3.1 Introduction 25

3.2 Factors Impacting on the Implementation of the Research 25

3.3 Literature Reviews and Stakeholder Consultation - Uganda 26
3.3.1 Comprehensive literature review 26
3.3.2 Country-specific literature review and stakeholder consultation 27

3.4 Development of Methodology 28
3.4.1 Research Hypothesis and Conceptual Framework 28
3.4.2 Key features of methodology 30
3.4.3 Research Process 31
3.4.4 Influence of limited field test 32
3.4.5 Influence of workshop 33

4 DISSEMINATION ACTIVITIES 36

5 CONCLUSIONS 37

5.1 Conclusions associated with development of the methodologies 37

5.2 Gender specific conclusions 38

5.3 Education specific conclusions 39

6 RECOMMENDATIONS 41

6.1 GLOBAL RECOMMENDATIONS 41

6.2 GENDER SPECIFIC RECOMMENDATIONS 41

6.3 EDUCATION specific recommendations 42

6.4 Areas identified for further research 43

Appendices

APPENDIX A LITERATURE REVIEW EDUCATION-ENERGY-POVERTY

APPENDIX B GENDER-ENERGY-POVERTY OUTPUTS

- B1 Review of key reports and methodologies for Gender-Energy-Poverty Linkages (South Africa)
- B2 Stakeholder Consultation – South Africa
- B3 Findings from the field trial and initial comments on methodology
- B4 Summary Report[2] from Methodology Workshop on Gender-Energy-Poverty Linkages (South Africa)

APPENDIX C EDUCATION-ENERGY-POVERY OUTPUTS

- C1 Review of Education Literature & Activities: Uganda
- C2 Uganda Workshop Report

APPENDIX D AREAS FOR FURTHER RESESEARCH

APPENDIX E FINAL METHODOLOGIES

- E1 Gender methodology
- E2 Education methodology

2

1 Introduction

1.1 PROJECT PURPOSE AND OBJECTIVE

The project purpose is to advance the understanding of energy use by the poor by identifying potential linkages between energy and poverty, particularly in MDG and cross cutting areas.

The objective is to develop peer reviewed methodologies that will allow researchers to collect quantitative data in the areas of gender-energy-poverty and education-energy-poverty. This may assist with informing the design of policies and programmes across these development sectors in terms of how access to and use of modern fuels can reduce poverty.

1.2 PHASE 1 TASK 1

Phase 1 task 1 was completed in March 2003 and the main activities and findings are described below.

The approach taken was to identify poverty and Millennium Development Goal (MDG) specialists and work with them to identify linkages between energy and the various sectors, identify current quantitative information that supports the linkages and adopt a research approach that bridges the current information gaps in order to provide DFID with recommendations on the priorities for further work under this project.

The activities undertaken to initiate the research process included:

- Workshops with relevant sector specialists at the Institute of Development Studies (IDS), Sussex University and at the Development Planning Unit (DPU), University College, London;
- Commissioned reviews in the areas of health, gender and environment[3];
- Interviews with specialists in donor organisations;
- Review of relevant Literature;
- Extensive web search to identify existing networks conducting work in the specified areas.

1.2.1. Extent of Quantitative Evidence to support these linkages

With notable exceptions in the health sector, (particularly in relation to Indoor Air Pollution) and more generally, in terms of how the poor progress through the energy ladder[4], the findings from these activities lead us to conclude that despite numerous papers highlighting the importance and range of potential linkages, empirical evidence is limited. This view is supported by the conclusions drawn from the commissioned health, environment and gender reviews.

[3] The detailed education review was delayed due to availability of subcontractors. It has been completed and will be reported as part of Activities 2-5.
[5] Bruce, Appendix 6, Phase 1-1 report

Health (Nigel Bruce)
The strongest MDG area of linkages and supporting quantitative evidence was found in the health sector. However, although Bruce concluded that 'quantitative' evidence is strongest for the health outcomes of IAP exposure (although not without limitations, in particular the lack of exposure assessment), there were major gaps in evidence on safety in the home and injuries involved in fuel collection. Bruce also notes that relevant data is lacking with regard to:

- The impacts of energy on health and related services;
- The opportunity costs associated with different energy situations;
- Appliance use in the home.

He concludes that 'qualitative' studies have an important role to play in understanding the impacts of energy poverty and interventions on health, yet these have generally been cited in reports and reviews even less systematically than has the quantitative evidence.

Environment (Cathy Riley)
Riley concludes that despite some support for the range of linkages between poverty, energy and environment, the empirical body of evidence generated to date is more substantial for linkages that run from poverty through energy to environment and back to poverty again than those operating in the other direction.

Gender (Wendy Annecke)
Annecke's review concludes that gender and energy project case studies provide evidence, albeit at this stage rather limited, of empowerment (in terms of both efficiency and equity) at work.

However, she has found that qualitative data is more common than quantitative in women/gender and energy studies. Quantitative data, such as details of the number of people involved, the extent of funding, and the measure of success, is rare in women/gender and energy projects generally.

1.2.2. Methodologies for exploring the linkages

Both researchers and donors questioned a focus solely on quantitative evidence.

'Although quantitative analysis may provide more conclusive evidence, qualitative data in the form of illustrations and anecdotes can add depth and richness to the study findings'[5].

IDS suggested that *'the most powerful (poverty) studies nest good participatory work within a wider population of which more clear cut facts are known – for instance nationally representative household surveys combined with participatory poverty assessments'*.

This is the approach taken by the ADB study that aims to assess the role of transport and energy infrastructure on poverty reduction (RETA 5947).

This study further serves to illustrate the increasing focus on the importance of Monitoring and Evaluation of projects that have an energy dimension. A number of donors and

[5] Quote from ADB project report for RETA 5947, Assessing the Impact of Transport and Energy Infrastructure on Poverty Reduction, 2001

researchers felt that there was a need for better monitoring and evaluation procedures on energy projects by poverty specialists. There was a clearly articulated need for indicators to highlight the relationship between energy and poverty either directly or mediated through health, environment, gender, etc

1.2.3. Related to the Process of the Study

Awareness, Interest, Desire and Action
There was a marked increase in awareness and interest in the potential role of energy in poverty reduction amongst poverty, social development and social science experts as they engaged with the Study. This was true with both the donor and researcher communities. The only exception was in the education sector where there was some doubt as to the importance of identifying and proving energy and education links. However, the interest of development specialists actively involved in the research process increased as relevant links emerged. DFID needs to consider how this process might be maintained and built upon.

The need for a common communication tool between energy and poverty/social specialists was stressed on a number of occasions by a variety of different participants in this Study.

Maintenance of the Information Gathered
Several participants in the Study have recommended that both the literature collected and the contact details of organisations involved with the Study are maintained and built upon so as to provide a resource for development practitioners interested in investigating this area of work.

Definitions and Assumptions about Energy, Poverty and Quantitative Studies
As the Study progressed a variety of issues surrounding definitions and assumptions came to light, which are dealt with in turn below:

This Study is about Energy for Reducing Poverty in the active sense, often abbreviated to 'energy-poverty linkages'. However, many participants and some of the literature also refer to 'energy poverty' using it in the sense similar to the more Western term 'fuel poverty' whereby people do not have sufficient energy to meet their basic needs (within a certain specified percentage of overall household income). This is more of a 'condition' than an active process and introduces the concept of energy as a 'right'.

There was also a tendency for participants to discuss electricity as a proxy for modern energy. However, the subject is much broader than this and more consideration for how this should be addressed is needed. It was generally felt that the focus on modern energy was exclusive of the most poor.

The definition of 'quantitative' is misleading as it means different things to different people. At its very basic sense it is numerical information. A more comprehensive perception of quantitative research is of an approach that uses sample surveys and structured interviews to collect large amounts of statistically significant data, which is then analysed, using statistical techniques.

Clarity on definitions and assumptions should be a key pre-requisite for any new studies into the area of energy for poverty reduction.

1.2.4. Conclusions

All Study participants acknowledged critical links between energy and poverty but expressed concern about the lack of sufficiently robust quantitative evidence available with which to garner the support of policy makers. There has therefore been a request for more quantitative data in support of '*a better understanding of the relationship between energy and time use in household consumption and production in poor households*'[6].

This Study confirms the interest in this sort of research and the willingness of researchers, organisations and donors to participate but concludes that there are a number of difficulties in producing what would be the definitive 'scientific study'[7].

Various methodological issues are raised from other studies conducted, and suggestions made for how these issues will be addressed.

Further information is available from Future Energy Solutions report 'R8020: Energy to Reduce Poverty – phase 1-1' August 2003.

1.2.5. Recommendations

The recommendations for the next phase of the project were for more detailed reviews of the areas of education and gender/women's empowerment and development of methodologies to provide quantitative evidence in these fields. These were based on relevance to achieving the MDGs, on the amount and quality of current information supporting these links and on the potential for undertaking work not being covered by other new research studies. For this reason we recommended education and gender/ women's empowerment as the two areas for a more detailed review in Task 2-5 of the Study.

Gender is justified on the basis that it represents one of the MDGs, is a cross cutting theme that appears regularly through every other MDG and there is a scarcity of quantitative data in this area.

Education is justified on the basis that this is one of the MDG areas, and it is regularly cited as an area of potential linkages by energy experts but its importance is queried by educationalists. Taking this area therefore offers an opportunity to explore these reservations further and see if this difference of opinion can be resolved.

Although aspects of health (such as injuries to women collecting fuelwood) do deserve attention (and it might be possible to combine some aspects of this issue with the gender review), this area was not selected for attention as there are a number of studies considering various aspects of health and energy ongoing and at least one major study being planned in China by the World Bank

1.3 PHASE 1 TASKS 2-5

1.3.1 Objectives

The objectives for Phase1 tasks 2-5 were to

[6] Cecelski in Bruce, appendix 6
[7] A phrase used by Professor Klitgaard of the RAND Graduate School, California in the Stage 1 workshop of the ADB's RETA 5947 project

- Develop and peer review a methodology for undertaking research that will provide quantitative evidence of links for both the education-energy-poverty and gender-energy-poverty areas and
- Disseminate the results through attending meetings and writing articles.

The research has particularly concentrated on the experiences of two developing countries in order to broaden the impact of the study, raise the profile of these issues and as a preliminary before undertaking new research.

1.3.2 Approach

The approach was to:

- Conduct an in-country review to discover if any quantitative evidence or methodologies already exist locally
- Develop a quantitative methodology including defining research questions
- Pilot test the methodology and questionnaire in the field and
- Peer review the methodology in a workshop forum.

Sections 2 and 3 describe the approach in more detail for gender and education respectively, Section 4 summarises the dissemination activities undertaken and Section 5 draws together the implications of the research findings and associated recommendations. Final methodologies are provided in Appendix E.

2 Gender-Energy-Poverty Linkages

2.1 INTRODUCTION

2.1.1 Gender issues – a growing awareness

Early work on gender issues centred on the *women in development* approach which seeks to reduce women's burden and offer women new opportunities. It is highly visible in projects that recognise that labour is divided between men and women, and where implementation is in the form of steps to assist women to fulfil their roles and responsibilities towards children, men and other women. However, this approach is now considered to entrench the traditional roles and responsibilities of women and does not encourage the exploration of new / shared roles by women and men.

The Fourth World Conference on Women in Beijing in 1995 is widely considered to have been a turning point in the consideration of gender issues. It is here that the major shift from *women in development* to *gender in development* occurred and the strategy for mainstreaming of gender through, and within, the work of all major donors and governments was adopted. Today, agencies and organisations, from the largest international development banks to the smallest NGOs, have polices to ensure that their development work provides benefits for men and women, or as a minimum do not disadvantage one group over another[8].

[8] Within the EU Policy Framework, the Cotonou ACP-EU Partnership Agreement explicitly calls for positive actions and the integration of gender concerns 'at every level of development co-operation, including macro-

Gender equality is now a core element of the strategy to reduce global poverty, and the framework for poverty reduction has been considerably expanded through the inclusion of the additional gender issues of security, opportunity, and empowerment[9]. There is now a clear understanding that unless women and men have equal capacities, opportunities and voice, the ambitious agenda set out in the Millennium Declaration, and its specific goals (the Millennium Development Goals – MDGs) attached to it, will not be achieved.

The specification of target dates for achieving the MDGs and the increased emphasis on quantitative analysis requires methodologies for data collection and the monitoring of progress. Measuring changes in gender equality requires work in areas that are sensitive, multi-faceted and inter-linked, and is made more difficult when a third dimension, such as energy, water or income generation, is added. There is a clear need to explore and understand these complex linkages as these have considerable implications for the formulation of policy and implementation strategies at all levels (global, national and local).

2.1.2 Gender-energy-poverty linkages

The linkages between gender and poverty have been extensively studied and explored from the perspective of sustainable livelihoods and to establish 'best practice' in development policy, planning, implementation and monitoring & evaluation. However, it is only in the last few years that the importance of gaining a greater understanding of the gender-energy-poverty nexus has been recognised. The body of evidence and experience is growing and is reinforcing the need to pay specific attention to gender in energy policy and projects as major driver for ensuring equitable, efficient and sustainable outcomes in development.

A number of recent reports and projects have highlighted the gaps and have begun to explore gender-energy-poverty linkages[10].

To underpin policy development and project design, there is an urgent need for data on energy use, supply and impacts to be disaggregated by gender. However, our literature review carried out in Task 1 concluded that there are few, if any, **quantitative** studies on gender-energy-poverty linkages.

It is clearly evident that there is need for quantitative work on a wide range of aspects related to the gender-energy-poverty nexus. However, as previously noted, research in this area must also be designed to observe and understand the complexities, relationships and intangible aspects of these linkages. These may be detected by quantitative methodologies but are unlikely to be explained effectively. Thus, there is a requirement for methodologies

---

economic policies, strategies and operations'. Also see 'Engendering Development', a report co-sponsored by the Gender and Development Board of the World Bank and the new EC Draft Regulation on Promoting Gender Equality in Development Cooperation (2004-2006)

[9] See World Development Report 2000 / 2001: 'Attacking Poverty'

[10] See Cecelski, 2000. 'Enabling equitable access to rural electrification: Current thinking and major activities in Energy, Poverty and Gender'. Briefing paper prepared for World Bank brainstorming meeting on *Emphasis on Poverty Alleviation and Women.* 26-27 January 2000, DFID, 2000. Energy for the Poor: Underpinning the Millennium Development Goals. UK Department for International Development, Clancy, Skutsch and Bachelor, 2003. 'The Gender-Energy-Poverty Nexus: Finding the energy to address gender concerns in development'., Final Report for DFID Project CNTR998521 and see http://www.dfid-kar-energy.org.uk?html/r8321/htm for a summary of 'A study of the impact of energy use on poor urban women and girls' livelihoods in Arusha, Tanzania'. This work will make a contrast between energy choices made in female-headed households and those mad in male-headed households.

that have been specifically designed to both quantify these linkages and explain them in detail.

This element of the project aimed to develop a methodology to explore gender-energy-poverty linkages that is capable of both collecting quantitative data and providing the necessary evidence to enable these results to be understood and explained.

2.2 FACTORS IMPACTING ON THE IMPLEMENTATION OF THE RESEARCH

2.2.1 Country Selection

Gender-energy-poverty issues are broad ranging and include aspects of ***accessibility, affordability and equality.*** The review of literature undertaken in Task 1 of the work programme indicated that previous research has led to major conclusions in the area of gender-energy-poverty linkages, often supported only by anecdotal evidence (i.e. from observations and qualitative research). These major assumptions are frequently used by international agencies and development banks to underpin their policies and resource allocations.

The initial literature review highlighted that much research has been undertaken in South Africa and that there is a particular interest and relevance for the area of gender-energy-poverty. The review of key reports and methodologies (see Appendix B1) and extensive stakeholder consultation (see Appendix B2) identified key areas in South Africa that require further research and, in particular, highlighted those where policy makers have indicated that there is a need for data to support future policy development.

In consultation with Wendy Annecke, it was confirmed that poor urban communities in South Africa offered a suitable context and therefore South Africa was selected for the research. See Section 2.4.2 for further details.

2.2.2 Complexity of Subject Area

Gender is a large area and it is doubtful whether one methodology can address and quantify all required parameters within this complex area. An alternative approach is to develop a methodology to enable users to tailor the approach and questions to the ***specific*** aspects of gender-energy-poverty linkages that they are examining.

Focusing in this way provides a manageable environment in which to explore and test the style and wording of the questions, and make an assessment of their appropriateness for quantitative data collection or whether it was more effective to obtain qualitative responses.

2.2.3 Quantitative versus Qualitative

As in most research, a combination of techniques is likely to be the most effective approach. The process of the developing the methodology was thus specifically designed to allow the testing of whether there are any types of questions / issues that are better explored using a quantitative or qualitative approach.

2.3 LITERATURE REVIEW AND STAKEHOLDER CONSULTATION – SOUTH AFRICA

2.3.1 Literature review

A comprehensive review of literature and work on gender, energy, poverty and empowerment, and their findings, was prepared under Task 1 of this project. In order to

further inform the methodology development work under Task 2-5, a country specific review was undertaken to determine:

- The extent to which quantitative gender-energy studies have been undertaken in South Africa and
- Whether any questionnaires that have been used could be made available.

Quantitative Studies

South Africa had a reasonable record of conducting gender-energy-poverty research in the 1990s[11] and therefore the literature review encompassed all gender and energy research from 1990-2003, describing 8 studies of particular interest to the current work.

However, the links between gender-energy-poverty in South Africa have generally been observed and described using participatory and qualitative methodologies rather than quantitative. These methodologies, which have used a variety of participatory techniques, have generally been designed to support small (typically 20 – 50 households) primary data collection studies. This type of study generates a large volume of information that cannot be processed in the same way as quantitative datasets. Rich, qualitative findings have therefore often been analysed in a too simplistic a manner and the conclusions drawn do not differ greatly from those obtained through quantitative questionnaires.

In the last 5 years, there has been little, if any, collection of primary data from households in South Africa. The principal studies that have involved quantitative surveys are the 'Monitoring and Roll-out of Solar Home Systems' and 'Electricity Basic Service Support Tariff (EBSST)'.

Access to Questionnaires

It proved difficult to get sight of questionnaires that have been used for studies in South Africa however it was clear that there is no standard format for capturing this type of data and the development of each survey methodology is undertaken as a new initiative.

Conclusions

The key conclusions drawn from the literature review are that:

- No quantitative energy and gender work that may be directly useful to this project has been undertaken in South Africa
- A follow-up study on the gender-energy-poverty nexus is long overdue in South Africa. Concepts have evolved and conditions have changed and gender and energy researchers need to re-visit and re-define the burden carried by women in the household.
- Both qualitative and quantitative research is required to provide empirical evidence for common assumptions made about women, gender and energy in poor households. "Common sense" or observed conditions from twenty years ago in rural areas do not necessarily apply to urban households in 2004. In the area of gender-energy-poverty linkages, methodologies are required that combine the collection of quantitative data through community surveys with qualitative tools and techniques to assist in understanding and explaining the results that are obtained.

The full literature review is available in Appendix B1.

[11] *Energia News* 6.1 October 2003, edited by Wendy Annecke and Tieho Makhabane, focuses on women/gender and energy studies in South Africa.

2.3.2 Stakeholder Consultation

A stakeholder consultation was undertaken in order to identify and understand the key specific areas where policy makers and development specialists believe there is a need for data and clearer indicators to underpin future policy directions, implementation of actions and resource allocations. Details of the areas identified can be found in Table 1 below.

Table 1: Focus areas for consideration

- The changing gender landscape in households. The position of women appears to be stronger than in the past, but why has this change occurred?
- Issues around changing gender roles and decision-making. How is this affecting decision-making regarding appliance purchase, for example, and who does the chores such as cooking?
- Employment and income was considered a key concern. For example, does energy make a contribution to income generation and job creation, and what is this contribution?
- Issues around time were felt to require further exploration. How do women, particularly in poor households, spend their time? What is considered to be a burden by women? How can energy and energy related appliances help to free up time, or reduce the 'burden'?
- Issues around cooking – this is assumed to be a key 'burden' for women and many development projects have been designed to address associated tasks such as the provision of alternative fuels and improved cook stoves (importantly these have not always brought the intended benefits). Would electric cooking improve the situation? It there a preference to use electricity for cooking (as reported)? Should this be facilitated? What are the constraints to such facilitation?
- How do men use energy, and how do their needs differ from those of women? Do men face particular energy related burdens? What are these and how can they be reduced?

The key conclusion from the stakeholder consultation was that cooking and most household chores are an area that remains firmly in the women's domain, and absorbs a substantial amount of time (and often human energy). Cooking is also a significant financial burden as it is a relatively high energy demand activity, and is a contributor (particularly where traditional fuels and paraffin are used) to poor indoor air quality and thus headaches and respiratory and eye problems. It also a core part of nutrition, and is therefore a fundamental component of basic household welfare.

Appendix B2 details the results and conclusions from these discussions.

2.4 DEVELOPMENT OF METHODOLOGY

2.4.1 Methodology Approach

The key recommendations arising from the literature review and the stakeholder consultation in South Africa were that:

- The focus of methodology development and field testing should explore 'whether electricity improves women's life regarding cooking and other chores in the household'.
- The methodology must comprise both quantitative and qualitative questions, and including participatory work (such as focus groups or semi-structured interviews)

2.4.2 Steps in Developing the Methodology

The methodology was then further developed and finalised (see Appendix E1) in an iterative manner through the following steps:

- Definition of the research hypothesis
- Target group and sample selection
- Development of the detailed methodology
    - Generation of an initial set of questions comprising quantitative questions to collect numerical data and qualitative 'exploratory' questions designed to encourage 'freeform' answers from respondents and provide insight and greater understanding of the reasons behind the quantitative data
    - Initial field-testing of questions and process (5 households)
    - Refinement of the wording and order of the questions based on the findings from the field-test
    - Re-testing of specific questions where changes had been made
    - Main field test to trial the questionnaire and process (the purpose of this was to conduct a survey of 20 households using the refined questions and to examine whether each question elicited the type of information that was intended
    - Processing of results from field test survey undertaken using the refined questionnaire
    - Methodology workshop with key stakeholders and researchers
    - Confirmation of those issues for which quantitative data collection is feasible and selection of issues more appropriately explored through qualitative (open) questions and participatory work
- Recommendation on and finalisation of the methodology

Further details on key steps in the process are provided in the following section:

2.4.2.1 Definition of the research hypothesis

The outputs from the literature review were used to define a range of pertinent research questions, and these were discussed and assessed with key researchers to confirm our direction.

Based on the review and interviews, a core research hypothesis was formulated. This revolved around women and cooking: "Does electricity improve women's life with respect to cooking?" Implicit in this question is the assumption that cooking is a burden to women. Previous South African literature has questioned this and during the interviews, the field test and the discussion of the methodology, this assumption was further questioned. Therefore during the brief test of the initial questionnaire it was considered appropriate to expand the

topic area and the research hypothesis was revised to:

'Electricity improves women's life regarding cooking and their other chores in the household'

The selection of a single research topic within the area of gender-energy-poverty facilitated a more detailed exploration of the style and wording of the questions, and an assessment of their appropriateness for quantitative data collection or whether it was more effective to obtain qualitative responses.

2.4.2.2 The target group and sample selection

Selecting the target group was an important part of the methodology. It was decided that the focus of the survey would be formal, low-income, urban households. Although it is worth noting that informal housing is likely to be with us in the long-term, and offers an equally interesting target group, formal housing was chosen as the focus since it is the most representative of the urban population.

Khayelitsha was selected as being representative in this regard, as well as having a spread of different settlement characteristics within the formal development.[12]

In total, 25 households were interviewed, five of which formed the questionnaire pilot sample. Three different parts of Khayelitsha were covered, as follows:

- 'B' section (Village 1, Village 2) – 6 questionnaires – an old established area. Typically built in 1985, and connected to electricity in 1994 when the National Electrification Programme started. These are considered Khayelitsha 'core' houses, and are often relatively poor.
- Harare – 7 questionnaires - recently built, owner-built houses. Previously the occupants lived in shacks on the same site, and the shacks were connected to electricity. Formal houses were often built around 1999 or 2000, although families have been using electricity sine 1995. Households are often relatively poor.
- Kulani Park, Litha Park – 7 questionnaires – houses generally built in late 1980s and connected to electricity at the same time, so they are established electricity users, and often have a (relatively) higher income although still classed as 'poor'.

2.4.2.3 Statistical validity of survey

The survey sample was too small to be statistically significant (20 households in the final fieldwork). This was because the project objective was primarily to develop the quantitative methodology rather than yield statistically sound results. Nevertheless, the sample size was such that potentially significant trends and characteristics could be identified, and it is hoped that some of these will be followed up in future project phases.

2.4.2.4 Development and testing of the detailed methodology

Overall Approach

The work undertaken centred on the development and testing of two types of questions:

[12] With larger projects it would be advisable to cover several regions within South Africa, as energy use characteristics are known to vary significantly around the country, and this may impact on gender relations in these parts.

- Those designed to extract data (**quantitative**) and
- Those designed to gain a deeper understanding of the reasons behind the quantitative findings. This means that the researchers can examine why and how any observed changes have been brought about, as well as the precise nature of the change that has occurred and whether this is positive or negative (**qualitative**)
- In a full community study these would be combined with p**articipatory work** with individual respondents or groups of community members to further explore issues that will enhance understanding of the findings from the household survey (not tested but elaborated during the methodology workshop).

Key features of the questionnaire and potential areas for participatory work are highlighted below (the refined and annotated questionnaire developed as a result of the field trial and methodology workshop is provided in Appendix B6):

Questionnaire development and piloting, and enumerator training.
Using the inputs received, a questionnaire was developed exploring the key research hypothesis. The questionnaire focused on more than just this hypothesis, however, and covered other energy and gender issues such as decision-making regarding a range of appliances, space heating, and general energy use issues. The questionnaire was piloted in 5 households, and during this process the two enumerators used were given guidance and trained where necessary (although the leading enumerator was specially selected for her competence in this area and her knowledge of the community).

Quantitative data collection

The questionnaire seeks to collect quantitative data in the following areas:

- Composition of households
- Employment and income profile
- Energy consumption (amount used and costs)
- Buying energy – gender issues and problems
- Main energy consuming activities in the household – perceptions
- Energy preferences for cooking and heating
- Appliance ownership
- Cooking – which meals are cooked and how long does it take to prepare?
- Cooking – any pre-cooking?
- Cooking – who cooks and who helps?
- Time spent on various activities
- The kitchen space
- Which foods are cooked?
- Energy used for cooking
- Electricity and cooking
- Fridges and food
- Heating the house

The above questions enable a series of indicators to be populated with data and thus provide the potential for assessing, comparing and monitoring key aspects of the research hypothesis across different communities and over time.

Examples for the selected research question include:

INDICATOR	PARAMETER / UNITS
Person making the decision on whether to purchase energy	**M/F/ADULTS/CHILDREN**
Person making the decision on when to purchase energy (M/F/adults/children)	M/F/adults/children
Person who goes to fetch / buy energy (M/F/adults/children)	M/F/adults/children
Person provided the money for purchasing energy (M/F/adults/children)	M/F/adults/children
Amount of energy bought or fetched at a time (cost)	Cost
Ownership of appliances	Equipment list
Length of appliance ownership (can be compared to electrification date and priority can be ascertained)	Date of purchase (each item)
Person making appliance purchase decisions	M/F/adults/children
Person providing money to make appliance purchase	M/F/adults/children
People involved in the purchase decision	Number and relationship
Method of purchasing electrical appliances	From list of options

For many of these 'quantitative' questions, supplementary questions are also included where the respondent is encouraged to provide views, attitudes, preferences and additional information in their own words.

There were also a number of areas related to perception, attitudes and preferences where quantification was not anticipated, examples include:

- Perceived energy consuming household activities
- Preferences for fuel / energy used
- Preferences for fuels / energy you would rather NOT use
- Perception of what appliances your family (not you) would most like to get
- Attitude to cooking and other household chores
- Perception of whether there is usually enough time available for cooking
- Perception of how cooking with electricity compares to using other fuels
- Preference for the 'best' appliance for cooking (whether currently used or not)
- Preference for the 'best' appliance for heating the house (whether currently used or not)

For these issues, a processing framework can be used to rank and / or compare responses (e.g. for Yes, No, Don't know etc type options) enabling these to be usefully explored quantitatively.

Qualitative information gathering

One of the key requirements of the field test was to consider whether the use of a quantitative approach was sufficient to fully assess and understand the core issues, which were the focus for the research. It had previously been recognised that a number of the issues within the questionnaire may potentially be more suited to qualitative exploration,

which offers more opportunities to achieve the level of understanding needed to begin to answer How? and Why? questions and explain quantified changes or impacts.

The field trial and methodology workshop highlighted aspects of the research hypothesis that, due to their complex or sensitive nature, are more appropriately explored using participatory techniques. Those questions which although originally formulated as 'quantitative' may be better approached with more qualitative questions (where the respondent provides a free form response) were also identified.

The questions / issues that are considered more appropriate to qualitative research include:

Question / Issue	Why qualitative?
What household chores are considered to be a burden by women?	The question of 'burden' was seen as a difficult area to investigate quantitatively (i.e. via questionnaires), and it was considered necessary to define the concept of 'burden' and explore burdensome tasks in a qualitative way (focus groups). It is essential to explore this from a women's perspective and within the context of the research community. Also relevant to consideration of men's burden (and their particular energy needs).
Is cooking a burden to women?	Explore qualitatively as with the broader question on household chores.
Appliance wants and needs	Qualitative research is necessary to explore this issue, as well as enabling the real benefits of appliances with respect to gender to be better understood
What method of purchase / acquisition was used for particular appliances (second-hand, lay-bye etc), and what was the source?	The high level of appliance ownership was somewhat of a surprise to both the field researchers from the community, other members of the project team and stakeholders. Due to the sensitive nature of some of the potential routes for appliance acquisition (e.g. those around stolen goods), it is considered best to explore this topic through qualitative work.
Who makes the decision to spend money on energy and appliances?	The decision-making process (as in any household in developed or developing countries, urban or rural) is a complex one and as such is less easily explored in simple quantitative questions posed in the questionnaire. The process involves consideration of many facets, including the availability and timing of finances, prioritisation, dialogue and dynamics between people in the household. This is a key issue that is more appropriately explored qualitatively since the complexities of the decision-making process are not likely to be accurately reflected in questionnaire responses.
Inclusion of HIV/AIDS in the research question	Although there are a number of questions that can be posed in a fully quantitative format, it may be more appropriate to use a qualitative approach if HIV/AIDS impacted households have been specifically included in the target sample.

Participatory methodologies

The selection of issues for participatory work draws on many elements of the methodology including initial consultation with community leaders and key stakeholders, an evaluation of the community 'characteristics' and the observations and findings from questionnaire–based surveys.

Although not explored in detail in this project (due to its original quantitative focus and time / budget constraints for the field trial), guidance on the inclusion of participatory work in research to explore gender-energy-poverty linkages and techniques that may be used has been included in Appendix E1.

Questionnaire editing, peer review: Based on the findings of the pilot, the questionnaire was modified. Comments from peers, including Future Energy Solutions, were also addressed. The end result was that the questionnaire was expanded significantly.

Questionnaire pilot 2: The expanded and revised questionnaire was briefly piloted in the field a second time, and minor modifications were made before finalising.

Final fieldwork: 20 households were covered in the fieldwork (see target group selection below). The enumerators were fluent in Xhosa, familiar with the areas of Khayelitsha, and knowledgeable on energy matters. All respondents were given two compact fluorescent lights at the end of the interview as a token of appreciation for their time, and the benefits of these lights were explained.

Data entry and processing: The questionnaire data was coded using a code sheet (which was compiled based on the range of responses received) and entered onto an Excel spreadsheet, where basic data analysis was done.

Methodology workshop: This workshop was held to assess key researchers' perceptions of both the methodology and findings. This produces invaluable discussion on these issues, and was also able to highlight key areas where further research is required. The methodology was refined in line with conclusions and recommendations from the workshop.

2.4.2.5 Finalisation of the Methodology

Influence of limited field test

The field test, although only limited, yielded a number of process and methodology lessons*:*

- Good initial community contact is essential. This ensures that community leaders and members, in particular those that will be directly involved, are aware of the research and potential benefits *(due to time constraints, the level of awareness amongst households in the target area was not ideal and resulted in the need for field researchers to explain the research in detail and that it had been discussed with and approved by community leaders; field researchers themselves identified that more information and contact is required prior to conducting the survey)*[13]

[13] This requirement was also recognised within the methodology development phase of DFID KaR 8145 Modern Energy: Impact on Microenterprises. Within the combined quantitative / qualitative methodology, the

- A limited pilot of the methodology should be undertaken prior to conducting any full survey. This provides an opportunity for the researchers to evaluate the respondents understanding of the wording and intention of each question, observe body language and collect verbal responses for collation and comparison. The use of several researchers of the level anticipated for the full survey provides valuable in-field training, enables input from the researchers as a direct consequence of their experience in engaging with community members and enables confirmation that it is possible to conduct the full survey using the selected level of researcher. Key lessons and methodological changes to be implemented in order to increase the effectiveness of data collection and the overall outcome of the survey *(in this study, as previously shown in the DFID KaR 8145, the field test undertaken led to significant clarification and modification of the questions designed to collect quantitative data and changes being made to the order in which the questions were arranged within the questionnaire)*

- Questions concerned with income e.g. sources and amounts from employment, business turnover and surplus, social welfare payments, etc) and expenditure should be positioned towards the end of the questionnaire. The earlier, less sensitive questions provide an opportunity to build trust and understanding between the researcher and interviewee, and can thus contribute to increasing the willingness of the respondent to provide answers to the more sensitive questions *(income and expenditure related questions were received better by respondents once these had been moved to the latter stages of the questionnaire).*

- Quantitative methodologies should not be used in isolation but in conjunction with qualitative methods. It is difficult to explore complex relations such as those inherent in gender, through simple questions. It is recognised that quantitative approaches to the typically complex issues around gender and energy will be limited because of the inability for questionnaires to probe particular relations and processes that become apparent. Qualitative work can add value by allowing the research question to explored further in order to understand current issues such that suitable questions and the questionnaire may be more effectively designed for a specific research activity (thus adding significant value to the quality of data collected (see Appendix B3 for further discussion).

- Once the questionnaire data is processed, qualitative methods (e.g. focus group discussions, semi-structured one-to-one interviews) should also be used to flesh out important issues that emerge.

For example, the respondent may answer that the 'woman' **decided** that a microwave should be purchased. This is probably a gross simplification of the dialogue and process involved in coming to this decision, and does not provide insight into who exactly was involved at different stages of the decision process. A respondent gives an answer that electric cooking is preferred because it is safer and cleaner than paraffin. Quantitatively it is not easy to explore this further, but in a qualitative process it may be possible to probe the threshold at which such a transition is made.

Although this research was about methodology rather than findings, the findings produced by the methodology are significant. The only comparison for this research was a study done

inclusion of an extensive community liaison phase prior to undertaking survey work in the community, during the fieldwork and providing feedback to community leaders after completion of each stage of work has secured full legitimacy, support and co-operation amongst the community members.

in 1994/5 – nearly ten years ago - in Khayelitsha. This (2003/2004) limited field test produced results significantly different to those reported ten years ago. That the methodology picked up the change indicates a degree of reliability in the questionnaire.

The findings are summarised in section 2.5 and described in detail in Appendix B3 and point to the need for follow up research as well as new areas for research (see Section 6 and Appendix D). They also clearly indicate that there is a need to develop combinations of qualitative and quantitative methodologies in order to better explore and understand changing gender-energy-poverty linkages.

Following completion of the field trial and collation of the findings, a number of important questions remained unanswered indicating that the methodology as tested may not have adequately explored these issues. The following questions were selected for further discussion (of both the findings and the approach used / required) at the methodology workshop:

- Is cooking a burden to women?
- Are women centrally involved in decision-making around domestic affairs?
- Does electricity improve the welfare of women?
- Does electricity reduce the safety and health aspects of significant paraffin use?
- What is the impact of HIV / AIDS in the area of gender and energy?

The findings that led to identification of the requirement for further exploration of these questions are outlined in the relevant section of Appendix B3.

Influence of methodology workshop

The aim of the methodology workshop was to review the process and findings (following processing of data from the limited field trial) generated by using the questionnaire (which comprised both quantitative data collection questions and associated 'open' questions to elicit free form attitude and explanatory responses). In addition, it was anticipated that areas for further research would also be identified.

The outputs from the workshop therefore covered:

- A detailed review of each area of questions contained within the questionnaire used for the field trial (*the findings from the field trial that informed this review are provided in Appendix B3; the key results of the review, together with its methodology recommendations are provided in Appendix B4*)
- Broad methodology recommendations
- Specific methodology recommendations
- Areas for further research *(see Section 6 and Appendix D).*

Broad methodology recommendations

Methodology needs to recognise the shifting gender landscape
The overall methodology is influenced by two broad emerging issues. The first relates to the apparent greater level of empowerment of women relating to domestic matters than is generally acknowledged. In this regard findings of the current project are supported by other research and experiences of workshop participants (see report on synthesis of discussions

with key stakeholders). The focus on the 'women' part of the 'gender' research area – previously considered amongst the most marginalized of groups – needs to shift, and a more equal focus on men is appropriate. The size of the sample made it difficult to interview men, but a quantitative survey must interview men and the opinion of the workshop was that the same questionnaire should be used, and men's opinion of women's burden probed. It would be equally necessary to engage men in focus groups. The increasing levels of gender-based domestic violence reported by some workshop participants provides added reason to shift some of the focus to men and men's perceptions of decision-making around purchasing electric appliances.

Women's burden needs clarification

A second broad emerging issue relates to changing concepts and in particular the question of what women consider to be a burden. Based on interviews with a range of researchers prior to the fieldwork, cooking was considered the primary energy-related burden for women. However the findings cast some doubt on this, and also highlight the fact that we don't in fact know what the principal burdens are that women face. Clarifying this is obviously an important first step to exploring how to ease women's burden, and what role energy may have in this regard. The role of cooking in women's identity and self-esteem has begun to be explored and we need to build on this work.

Inclusion of both quantitative and qualitative approaches

In general, the methodology highlighted some common shortcomings of quantitative approaches, and assisted in clarifying areas where parallel qualitative work is crucial to obtaining an adequate insight into gender and energy issues. Questionnaires generally are adequate to obtain simple reasons for a particular course of action or preference. For example, for those who state that they prefer electricity for cooking, when asked 'why?' may typically respond 'it is more versatile'. While useful, this is a fairly superficial response, and to understand the issue in more depth is difficult via a questionnaire. Qualitative work may be required.

Specific Methodology Recommendations

The following specific methodology recommendations serve to identify those questions that, following the field test, were considered better suited to use of a qualitative approach and also where additions / modifications were required to the original questions as a result of the reaction / responses of the interviewees.

- The question of 'burden' was seen as a difficult area to investigate quantitatively and it was considered necessary to define the concept of 'burden' and explore burdensome tasks in a qualitative way (focus groups, role play, well-being maps).
- Following from the above point, it was considered that the issue of whether cooking is a burden to women should be explored qualitatively.
- The issue of energy and appliances 'preferences' can be usefully explored in a quantitative methodology, and is adequately dealt with in the current questionnaire.
- It was felt that the word 'preference' needed further consideration and unpacking, particularly considering how it may be translated into Xhosa or other languages (in Xhosa it is often translated as 'like').
- To explore appliance wants and needs, as well as the real benefits of appliances with respect to gender, qualitative research is necessary.
- General appliance issues in the questionnaire:

    - Consider including whether the appliance is broken or working (although workshop participants generally considered that this was usually picked up when the questionnaire interview was being undertaken, but nevertheless it was felt useful to include one question to this effect).
    - It would be useful to establish how long ago the appliance was acquired. However it was acknowledged that this might extend the questionnaire, which could be problematic.
    - It would be useful to know how particular appliances were acquired (second-hand, lay-bye etc), although this was likely to be outside the scope of the questionnaire, and requires at least some qualitative work.
- The issue of whether electricity makes women's life easier with respect to cooking can be usefully explored quantitatively. It is adequately addressed in the current questionnaire, but should also consider including the following:
    - Part of cooking is cleaning up afterwards.
    - Buying the food is also part of cooking.
    - The questionnaire should be clear that the 'cooking time' includes preparation, not just time 'on the stove'.
- The important issue of decision-making around energy and appliances needs to be explored qualitatively as the complexities of the decision-making process are not likely to be accurately reflected in questionnaire responses.
    - Nevertheless it was considered useful to include questions such as those in the questionnaire, but to regard the responses as indicative rather than comprehensive responses.
    - The question "has a man ever stopped you getting a kitchen appliance" was felt to be too coarse, and respondents could sometimes not understand what was being asked. More useful questions were suggested as:
        - Do you consult other household members when buying an appliance?
    - In addition to the above, it was thought useful to explore questions such as the following qualitatively (i.e. not in the questionnaire):
        - Do you always agree on appliance purchase when you discuss appliance purchase?
        - What do you do if you don't agree?
- Include HIV/AIDS families into the pilot sample to explore what the implications for the methodology may be. This should be done in conjunction with local AIDS support groups, and must be at least partly qualitative rather than quantitative.

The final methodology for gender is provided in Appendix E1.

2.5 INITIAL FINDINGS

Our evidence from the pilot study (25 households) of this project and also from the pre-energisation surveys undertaken as part of R8145 (Modern energy: Impact on Micro-enterprise) clearly indicates that in both urban and rural poor[1] households in South Africa there is a strong preference to use electricity for cooking. For full details see Appendix B3.

In unelectrified homes in the process of receiving grid connections, there was a clear aspiration for cooking with electricity and clear evidence of the advance acquisition of electric cookers (ranging from 1-2 ring hotplates to 4 ring cookers with ovens). Although LPG is used by some households, mainly for fridges and lighting, most of the households

interviewed considered it to be dangerous (i.e. there is significant education / awareness raising needed if this fuel is to be widely adopted for cooking). Other problems include lack of transport for large cylinders and significantly greater cash requirements for bulk purchase than for paraffin – which can be bought widely and in small amounts.

- HHs preferring electricity for cooking: 85%
- HHs preferring paraffin for cooking: 0%
- HHs preferring LPG for cooking: 15%

Our results have indicated a level of household appliance ownership which has surprised all of the researchers and stakeholders involved in the collection of data and review of the findings (see Appendix B3). The use of electricity and the level of ownership of appliances in this limited pilot study has provided those who have seen the results with 'food for thought' regarding existing electrification policies and the possible need to complement these with other enablers such as micro-credit for appliance purchase and the provision of a mixed energy solutions (rather than just 'rolling out' electricity). The lack of access to other clean fuels (in particular LPG) in electrified communities in South Africa is currently a major issue of concern to the Department of Minerals and Energy and to ESKOM (electricity utility).

Electricity is clearly considered the 'best' energy to use for cooking. Reasons given were mainly that it is quick, convenient, clean and healthy. 74% of households said they'd rather not use paraffin for cooking, mainly because it is dirty and unhealthy. There is a fear amongst some households of using LPG.

Of importance is that our studies also showed that the fuel of preference for heating in these electrified homes (which are block built houses) remains paraffin (with all the associated indoor air pollution problems).

- HHs preferring electricity for heating: 22%
- HHs preferring paraffin for heating: 61%

Other responses in the questionnaire indicate that one of the reasons for using paraffin heaters is that one can also cook or heat water at the same time. It is also clear that electricity is considered relatively expensive. The problems almost all households appear to find in purchasing electricity also contribute to the residual use of paraffin. In South Africa electricity can be bought using a pre-payment system and there is no pre-set amount that needs to be bought at any one time. It is bought from electricity vendors who are often shop keepers as well and keep shop hours. In addition the security issues in many communities in South Africa severely restrict the amount of money that a vendor can safely hold and they are therefore frequently closed, particularly after dusk. Paraffin remains readily available from multiple small outlets within the community.

From a gender perspective, our findings have also provided key observations that household decision making on appliance purchase is not controlled by the men (even where he is nominally head of the household), as had been the perception of our stakeholders prior to the study.

1. For households in Cape Town, the 'breadline' is formally recognized as a monthly income of R1000. Although income figures given cannot be wholly relied, of the 25 households surveyed in the pilot study in South Africa (focused on a key aspect of gender relations), 58% had income R1000 pm or below and 26% had

income R500 p.m. or below. With the majority of households interviewed providing figures that indicate that they are living below the official breadline, these cannot be considered as middle or higher income households.

3 Education–Energy-Poverty Linkages

3.1 INTRODUCTION

Basic Education for all has remained the number one education priority within the international community following its identification at the 1990 conference organised by UNESCO, the World Bank, UNDP and UNICEF and held in Thailand. Following a concerted effort by governments, most countries in the last 20 years have achieved dramatic increases in primary school enrolment ratios, however, Africa still lags behind the rest of the world with only 67% of its primary school aged children in school. Some sub-Saharan countries experienced decreases in enrolment in the late 1980s and early 1990s following an economic slump, as seen in Botswana, Mozambique, Lesotho and Tanzania.

In the Millennium Development Goals, contained in the Millennium Declaration adopted by the United Nations at the Millennium summit in 2000, the attainment of universal primary level education for all by 2015 was a central aim.

Although there is recognition of the links by energy experts, the extent and magnitude of these links are not known hence specific research to investigate the possible linkages has been carried out in Uganda and is described in this report.

3.2 FACTORS IMPACTING ON THE IMPLEMENTATION OF THE RESEARCH

A major factor impacting on the implementation of the education-energy-poverty research can be directly related to meeting international development goals set for education. While some gains have been made in improving enrolment, more than one third of the world's children are still denied a chance of the basic five years of primary education to achieve literacy[14].

Uganda was selected as an ideal country to complement the research based on its current activities and policies regarding education, poverty and energy.

In Uganda the strategies for reducing poverty were formulated under the Poverty Eradication Action Plan (PEAP) in 1997 and revised in 2001 and 2002. They place a high priority on promoting cross-sectoral participatory processes that focus on raising educational achievements amongst the poor. As 80% of the population in Uganda live in rural areas, programmes such as the World Bank Energy for Rural Transformation (ERT) play a significant role in realising this national goal of raising educational achievements amongst the poor.

The implementation of Universal Primary Education (UPE) programme in Uganda began in February 1997 wherein the government took over payment of tuition fees for up to four children from every family, regularised the salaries of teachers, rehabilitated and expanded

[14] Statement by ACTIONAID, 2003.

school facilities and distributed textbooks. The programme has been very successful with nationwide primary school enrolment figures have increasing from 2.7m in 1996 to 6.8m by February 2002.

UPEs success gives rise the challenge of meeting the educational needs of children graduating from primary schools and to provide functional literacy and/or employment skills to the primary school drop-outs as well as large numbers of illiterate adults, especially in rural areas where most of the population resides.

The ERT programme also influences the energy situation in Uganda since it responds to the need to increase the electrification rate. Currently only 5% of Uganda has electricity and electrification is less than 2% in rural areas. Presently 1% of the population provides itself with electricity using diesel and petrol gensets (portable generators), car batteries and solar photovoltaic (PV) systems. Electricity is consumed in the following proportions by sectors: residential (55%), commercial (24%), industrial (20%), street lighting (1%).

Biomass (fuelwood, charcoal and crop residues) plays a significant role in Uganda's energy supply constituting over 90% of total energy consumption in the country, and that most of the traditional energy technologies (wood, charcoal stoves and kilns) currently used in Uganda, are inefficient.

3.3 LITERATURE REVIEWS AND STAKEHOLDER CONSULTATION - UGANDA

3.3.1 Comprehensive literature review

The purpose of this desk study review was to find evidence of the linkages between energy, poverty and education, with emphasis on modern energy, and electricity in particular. Though some successful cases cited benefits such as prolonged hours working through the provision of lighting, and relief in the domestic burden of girls to enable longer study time, there remains scepticism amongst educationalists that do not perceive access to energy services as an education priority.

The main education priorities reviewed under this research included basic education for all, equal access to education for girls, improvements in the quality of teacher training, and the provisions of adequate materials and infrastructure to improve learning.

Although the focus of the review was global, no evidence was found of quantitative research that demonstrated the linkages between education, energy and poverty. Research in South Africa provided the potential to explore the direct and quantitative linkages between modern energy and educational output based on its recent electrification programme. This factor, coupled with the growing prevalence of Information and Communication Technologies (ICTs) in education worldwide, made South Africa an obvious choice for examination. However, despite the obvious desire to incorporate ICTs into the education system, only 8.8% of South African schools had access to one or more computers and suffered financial and infrastructural limitations in achieving ICT objectives.

The infancy of the South African energy programme and the lack of development infrastructure to support modern energy services such as ICTs and computers in schools, made South Africa an inappropriate location to test the validity of the education methodology under this research. However, the findings did encourage a further degree of literature research that incorporated ICT development into its structure.

3.3.2 Country-specific literature review and stakeholder consultation

In order to narrow the scope of the previous research, that was primarily global in focus, a country-specific review and stakeholder consultation was carried out in Uganda. It examined the extent to which the fusion of energy, education and poverty are addressed on a range of initiatives that included ICT development in schools.

The cross-sectoral links under the World Bank ERT programme is co-ordinated by the Ministry of energy and Mineral Resources. The Ministry's Final Project Implementation Plan and the Education Sector Investment Plan both feed into the ERT programme, supporting the deployment of ICTs in post-primary schools across Uganda. Indeed Uganda's high achievements in attaining Universal Primary Education to date has resulted in a need to balance the success with a comprehensive framework for secondary and higher level education that incorporates technology that enables Uganda to compete in the global marketplace.

Stakeholder consultation was undertaken with the representatives from the World Bank, Ministry of Education and Sports, the Makerere Institute of Social Research, and local education specialists. The consultations revealed that energy policy in Uganda makes clear linkages across other sectors that include environment, water resources, agriculture, forestry, industry, health, transport, and education.

The results from the country-specific literature review and stakeholder consultation confirm that Uganda was a suitable country in which to test the education methodology.

The results also show that there is no record of research or primary data in Uganda that relates to linkages between energy, education and poverty, although linkages between energy and education are reflected in the current government programmes outlined above. The reviewers found that on an anecdotal level links were made between education and energy and it was felt that if people understood more about energy, then they would have more control over their lives and a greater ability to overcome poverty.

Though no evidence of the use of any methodology to directly measure the impacts of energy services on educational attainment was available, there was plenty of evidence that people recognised education was relevant to their economic and social security.

The findings did however reveal that there is a correlation between high drop out rates at primary school level and energy related factors such as poor sanitation and inadequate meal provision being major reasons for student drop out rates. These are clearly linked to energy. It follows that the education 'menu' must be improved to provide real learning about energy through experiential learning, access to ICT, good pedagogy etc. Measures of success would follow.

The linkages between energy and ICT and education generally lack good assessment and information in Uganda. Thus there is a need for further study of the various impacts that energy and ICT could possibly have on improving the quality of education.[15] Though access to energy and ICT is currently limited, the plan sets out what benefits are to be expected and include improved teacher and student learning.

[15] Extract from the Final Project Implementation Plan, Ministry of Education and Sports, Education Planning Department, May 2002.

3.4 DEVELOPMENT OF METHODOLOGY

This methodology has been designed as an assessment tool for establishing the level and applicability of the linkages between education, energy and poverty. It is intended that it be used as a generic tool by professional researchers and development practitioners to determine approaches for separate or joined-up initiatives related to the education-energy-poverty nexus.

The methodology, contextualised in greater detail under Appendix E2.1, was developed by taking the following approach:

- The development of a methodology and research techniques as a theoretical written document;
- The design of quantitative research questions;
- The design of qualitative, semi-structured questions intended to add context to the quantitative data and greater understanding of the broader research question;
- A brief field trial of the quantitative and qualitative questions;
- Refinement of the questions in response to the field trial findings;
- A methodology peer review workshop between key stakeholders and researchers to examine the context, concept and general methodology format;
- Final refinement of the methodology to reflect revisions;

3.4.1 Research Hypothesis and Conceptual Framework

The purpose of the methodology is to identify the ways in which the provision of modern energy services to schools and communities can positively impact on educational achievement, leading to more secure livelihood strategies and sustainable poverty reduction.

This can be achieved through the development of an analytical framework based on two variants of the Sustainable Livelihoods model – human and social capital. Human and social assets support the research framework acting as vehicles for understanding the micro-level conditions and livelihood determinants that are affected through the provision of modern energy services.

Within this context, education is the main component of human capital and traditional quantitative literature on human capital concentrates primarily on rates of return to schooling. It is something that is therefore embodied in individuals through accumulated learning in formal and non-formal education. The focus is on whether the provision/non provision of energy services in primary schools and local communities leads to increases in the levels of enrolment, access, teaching quality, advanced technological teaching tools and methods, improved facilities and infrastructure.

Social capital in this context relates to the norms and networks that facilitate joint and other collaborative community based actions and results in enhancement of community (and by extension, individual) well-being. Though measuring social capital is more difficult than measuring human capital, focus is on the number of social networks created pre and post energisation and the share and part that local people play in this. Social capital is also reflected in the number and types of additional benefits/dis-benefits that modern energy

services provide that increases the stocks and shares available to community members and groups.

Based on the low prevalence of ICT availability in Uganda, it was decided that the focus of the methodology would not be limited only to ICT development and therefore includes the provision of other factors that impact on educational attainment that rely on energy services for activation.

The questions below provide a context for the specific aspects of the energy-education-poverty nexus explored under this study. They encompass a broad range of issues that set the framework for the research.

The school focused questions, embodied in the human capital framework are:

- In what ways does the provision of modern energy services assist in the reduction of poverty through educational attainment?

- In what ways do new forms of energy services enhance or displace existing services and how does this affect vulnerable groups within the community?

These questions focus on aspects of access, equity and quality of education and are related to the impacts of modern energy services on enrolment levels, improvements in teaching and learning quality and specific groups negatively or positively impacted.

The community focused questions, embodied in the social capital framework are:

- What community level decision-making processes are impacted by the provision of modern energy services?

- Who in the community gains and who looses from the introduction of modern energy services?

These aspects of the research question focus on the impacts of energy services on relationships in the community and the ways in which these services impact on local networks, stocks and shares of social capital and the overall well-being of a community.

These core questions underpin the research framework and provide context for the qualitative and quantitative questionnaires.

Hence the research hypothesis emerging from this can be defined as:

How does access to modern energy services in community primary schools impact on education?

The research uses both quantitative and qualitative information for understanding the range of issues, and to provide context for future planning and decision-making initiatives in the energy-education-poverty arena.

The purpose of the quantitative indicators is to establish the extent of change due to the availability of modern energy services in a defined area, region, or country and, wherever

possible, should be supported by historical and secondary data that substantiates or provides additional information. The quantitative indicators can provide information concerning the dimensions of outcomes but cannot provide information that reflects cause and effect. The quantitative indicators will enable us to determine the level of modern energy coverage in local and regional primary schools and their surrounding communities.

The qualitative indicators are designed to respond to a growing body of research that is changing the way poverty is conceptualised and measured that goes beyond single-indicator economic measures in order to highlight the multidimensional aspects of poverty. Use of participatory qualitative research techniques and methods outlined in the methodology will enable the poor to participate in the design of relevant indicators without bias being filtered through the lenses of external experts.

The participatory approach will also encourage study teams to explore key issues that emerge across countries, cultures, social groupings, gender, age, occupation and other dimensions of local importance.

All the study tools outlined in the methodology are designed to explore and understand the perspectives and insights of the target stakeholders and enable them to express and analyse their own realities with outsiders in a facilitating role.

3.4.2 Key features of methodology

The quantitative questionnaire seeks to collect data from a range of sources that include community members, primary and head teachers, administrators and parents/guardians in the community and requires additional background material to be provided with a community characteristics log. The questionnaire focused on potential impacts on energy services related to access, quality and equity across the following areas:

- Teacher retention
- Educational attainment of pupils
- Curriculum development
- ICT development in schools
- Use of funds
- Fee levels
- Services provided by the community
- Literacy rates
- Drop-out ratios
- Hours spent teaching versus hours spent in preparation and marking
- Timing of teaching, lesson preparation of marking
- Hours of study.

The research methodology is designed to support the achievement of the Millennium Development Goals, specifically MDG 2, to “ensure Universal Primary Education” (UPE) and in doing so focuses attention at the school and community level, with no household level analysis. In supporting achievement of the MDGs the research assumes that the provision and easy access of modern energy services can enable:

- Increases in attendance and reduction in drop-out rates;

- Promotion of learner friendly environments in schools through access to clean water, improved sanitation, lighting and space heating/cooling;
- Increased access to education media and ICTs in schools and adult training.
- Increased teacher retention (through improved teaching facilities, information services and energised housing)
- Lighting for the provision of evening classes in schools (for the benefit of students, adults, the community);
- Increased community access to school facilities and services.
- Liberation of children from heavy involvement in survival activities;
- Reduction in child labour activities resulting from use of labour saving domestic appliances;
- Lighting for home study beyond daylight hours;

3.4.3 Research Process

The methodology should be deployed in both energised and non-energised communities that reflect the characteristics outlined here:

- Energised community + energised school
- Energised community + energised school with ICT
- Non-energised community + non-energised school
- Energised school + non-energised community
- Energised school with ICT + non-energised community
- Energised community + non-energised school.

Ideally the methodology would be conducted in both delineated urban and rural communities in order to reflect the diversity of impacts, a factor that cannot be achieved by focus on a limited range of situations and locations.

Broad arrays of study participants are needed to reflect the rich and diverse nature of the information at both the local school and local community level. The key groups and individuals to be consulted are outlined below.

Community – At the community level participants must include energy providers, teachers, head teachers/principals, parents, female students, male students, female headed households, male headed households, and any local leaders and/or business professionals with knowledge of the issues.

School – Head Teachers or Principals, teachers (across various subjects), female and male pupils. In the context of the logical framework for the research only children aged 5-14 years are included in this analysis. The ILO defines children as “persons younger than 15 years of age. The lower age limit is based on the minimum age that a child reported an occupation and the youngest age for starting an education”. Therefore, this relates to school children attending primary schools and those of primary school age who are not attending school.

Size of Study

The size and scope of the study will be determined by the particular country context and as a result of consultations between study practitioners and their teams. However, an even number of multiple urban and rural locations should be considered wherever possible.

Study Team
The study must be led by a team leader who is an experienced sociologist, anthropologist, political scientist or other social scientist. A large country study, involving research at multiple sites would require a number of teams comprising 4 people. An ideal team would include an equal number of men and women to ensure gender issues are comprehensively covered.

Use local research networks. This will help to strengthen local capacity for participatory and qualitative research by hiring and training local experts where possible to conduct the studies. In addition, regional and global workshops will provide opportunities for study team leaders to network with counterparts from other countries.

Number of days per community
The length of time spent in a community will depend on the size and scope of the study and the locations chosen to conduct the research. A time estimate of 1 hour is envisaged for completion of the quantitative questionnaire. However, the range of consultations and participants for the qualitative survey will require greater consultation time. It is estimated that an average of 1-2 days should be spent in each community that would ideally focus on one day at the school (pre-arranged) interviewing teachers, principals and conducting visual/illustrative exercises with pupils; and, one full day in the community (possibly at a local community centre, or even the school) in order to capitalise on interviewing people across the whole day – from the start to the end of the working day

Share study findings and site reports with participating communities. In addition, the final report should be available to local public, private and civil society leaders. This form of communication will raise awareness and help to build partnerships for future activities.

Training
The research team conducting the qualitative survey should be thoroughly trained in the use of participatory methods, with particular focus or adaptation of the ones outlined under this research. Training should take no less than one week and include a pilot field test that explores the purpose, themes and methods to be used in the 'live' studies. This will ensure a common understanding amongst the team of how to use the methods appropriately.

3.4.4 Influence of limited field test

Field tests were conducted in two communities, one connected to the grid (with a back-up generator) and the other without modern energy. Both schools are located in the peri-urban Mukono district in Kampala, one government run and the other privately owned. The field trials took place simultaneously over one day and therefore do not represent the broad range of schools in Uganda, many of which are established in rural locations. Interviews were held with head teachers, teachers and parents of children at the schools.

Overall results showed that respondents were very conscious of the potential benefits from the provision of modern energy and came up with a wide range of linkages that they felt would enable them to improve the quality of the education provided. Teachers, in particular those who had worked in non-electrified schools and then moved to an electrified school felt it was a great enabler for them in their teaching capacity.

Research revealed that there was a lack of understanding regarding the decision-making process. It was unclear why one school had embedded the supply of electricity into their operations to the extent that they could not conceive of how they would manage without it, whilst another, only 50 yards away from the grid had never considered it as a priority for budgetary expenditure.

Use of both the quantitative and qualitative research revealed that although a great deal of teacher motivation in terms of educational attainment was evident, it was more difficult to discern how energy services increased pupils ability to learn.

The field test revealed that the context for examining links should not be limited to primary schools. It was felt that secondary school level assessments are necessary to more firmly establish linkages between educational attainment, energy and poverty reduction as it would enable a greater degree of definition and analysis, as pupils would be older and more able to fully participate in the study outputs.

It was felt that the methodology should also include case study examples from Teacher Training Colleges. This would provide a baseline to track changes in educational attainment over time – i.e. primary, secondary, tertiary as and when schools became electrified.

Some terms and definitions such as energisation were not easy for researchers to translate for the benefit of local level study participants. It is advised that the methodology incorporate a guide that can be readily adapted to the specific context and conditions under which it is being applied. However, the research methodology clearly states that approaches and methods should be adapted to the context under which it is being applied.

The impacts of the field tests are incorporated under the following section as workshop participants refined and assimilated these impacts into their review of the overall methodology.

3.4.5 Influence of workshop

The workshop was held at the Makerere Institute of Social Research, Kampala on 26th February 2004 and was attended by 10 participants. A FES social development researcher facilitated the workshop and provided an introduction that focused on understanding of the conceptual framework, research methods and field study outputs. The objectives of the workshop were to:

- Provide the background and context for the project;
- Present rationale and approach;
- Present context and tools used in Uganda;
- Critically review the national approach and tools being applied;
- Assimilate the input from the participants on the broader issues of the energy, education and poverty nexus.

The main influence of the workshop was the agreements on the importance of the conceptual links between education, energy and poverty. The Sustainable Livelihoods and the Energy Ladder analysis[16], are important conceptual ideas that embody the methodology framework and provide guidance on the potential of energy services to promote change on local level.

The Questionnaire

[16] Analysis of the Energy Ladder was provided in Phase 1 of the project under Appendix 6 (pages 9 and 10).

Participants advised that the questionnaire should be broadened to encompass all forms of energy used both in schools and the local communities. This would provide a breakdown of the types of energy used for specific activities and provide development practitioners with information that can enable them to more adequately meet their development objectives.

It was felt that a section on household energy use should be incorporated into the questionnaire. This information would provide a more accurate breakdown of the extent to which children use energy services for educational purposes in the home, and provide background and context on other energy related influences that either enhance or deter them from education. It was felt that this approach would also provide clarity on the ways in which communities benefit from energy services in tackling poverty reduction, and would enable disaggregation of the impacts resulting from energisation of the school, and the community (i.e. non-school related aspects).

Outlined below are the specific revisions to the questionnaire suggested by workshop participants:

Head Teachers/Administrators

- Questionnaire should include the type of school, name of school, and enrolment in school by gender;
- Children as young as four should not be considered in research questions;
- Clarity on how to calculate drop-out and completion rates should be provided;
- With regard to curriculum changes, there should be a question that reflects life skills;
- The distance in kilometres from the nearest source of energy should be incorporated;

Primary School Teachers Questionnaire Section

- Include type of school – i.e. day/boarding, private/public (ownership e.g. mission/private for profit)
- Questionnaire should reflect the number of hours teachers work per week.
- Energy sources in teacher's accommodation should be incorporated.
- With regard to teacher retention rates questions should have options that include school reputation and performance, extra curricula activities, and fringe benefits.

Parents /Guardians Questionnaire

- Parents/Guardians should be asked how many children they have;
- Energy usage: options should include cylinder gas, grid, solar and biogas;
- Ask what major source of energy parents/guardians use;
- Educational attainment: additional question should include how many hours do your children spend on collecting firewood.
- To what extent has your major source of energy helped/constrained your children in attaining education?"
- Why do you not have electricity

<u>Creating Opportunities</u>

Workshop participants emphasised the importance of creating greater awareness of the linkages between education, energy and poverty through the establishment of incentives that would include loan schemes for energy enhancement. The creation of economic opportunities through initiatives such as community level micro-enterprise were also considered important for creating awareness of the usefulness of energy services in helping to alleviate poverty.

Collaboration with Ministries

The inputs of the various representatives from the Ministries of Education & Sports, Energy & Mineral Resources promoted the idea of a collaborative approach of ministries through the development of cross-departmental strategies to link energy, education and poverty initiatives.

Although the participants appreciated that the researchers were trying to develop a generic approach, they thought that it was very important to consider the context of each country and allow for this. For example, educational attainment factors of equity, access and quality should be disaggregated in terms of rural, urban and gender issues and take into account various policies and projects being implemented.

4 Dissemination activities

Dissemination of the results and awareness raising of the issues being explored by the project has been undertaken during the life of the project.

There was an article in the DFID Energy Newsletter Issue 14 May 2002 that introduced the project. A second article was published in Issue 17 November 2003 describing Phase 1 task1 and a third article has been written and will be published in the May 2004 Newsletter summarising the final results.

The stakeholder consultation raised the profile of the issues and demonstrated that there was strong support in South Africa for gender-energy-poverty issues and in Uganda for education-energy-poverty issues. In Uganda we provided support to the Ministry of Education and Sport in the preparation a the Terms of Reference under the ERT programme for the provision of consultancy services for an assessment of energy and ICT needs in post primary education institutions in Uganda.

The field testing in both Uganda and South Africa provided valuable awareness raising of the issues at the community level and the communities showed strong interest in being involved in future work

The multi-stakeholder workshops (in South Africa and Uganda) to peer review the research methodology and examine the lessons learned from pilot testing were well attended and included policy makers (Ministry of Energy, Ministry of Education and Sport), NGOs and researchers from gender, energy and education fields (Mineral and Energy Policy Centre/AFREPREN, Sustainable Energy Africa, ERC/University of Cape Town, Makerere Institute of Social Research, Kampala).

The project objectives were presented at the GVEP / EUEI Monitoring and Evaluation (M&E) Core Group Meeting. The focus of the M&E Core group is to develop indicators that can be used by donors, investors to monitor the impact (i.e. outcomes) of energy projects. The approach, findings to date and observations from this project (R8202) and DFID KaR 8145 were presented and discussed (slides will be disseminated to participants and the associated interest group).

The project is promoted on the following web sites

- http://www.etsu.com/energy_voices/Assets/R8020ProjectSummary.pdf
- http://www.dfid-kar-energy.org.uk/html/r8020.htm

During visits to the World Bank and ADB we have discussed the findings of the project with energy and gender representatives, however, education specialists were reluctant to meet with us. Although during the preparation visit to Uganda education specialists from the British Council and Africa Energy Unit of the World Bank were interested in the project and keen to work with us in the future.

5 Conclusions

5.1 CONCLUSIONS ASSOCIATED WITH DEVELOPMENT OF THE METHODOLOGIES

Linkages between complex issues, such as gender or education, with energy and poverty are not direct. In many cases, there is an assumed link but this has not been proven. If energy is introduced as a third element, the potential for additional direct and indirect linkages between pairs further increases with a consequential increase in the complexity of the research hypothesis.

The approach for the methodology needs to reflect the multiple, inter-related linkages.
The approach and content of a methodology to explore gender or education linkages with energy and poverty needs to reflect the presence of multiple, inter-related linkages, recognise that the involvement of energy may be direct or indirect, and also include the relationship with poverty.

Not just a quantitative methodology
A purely quantitative methodology cannot adequately explore and represent the complexity of linkages involving multi-faceted elements such as education, gender and poverty.

Embed the methodology in a suitable analytical framework
For a methodology to be effective in exploring complex linkages, quantitative and qualitative elements (either merged or separate) must be combined within a suitable analytical framework. This study (education-energy-poverty component) has shown that elements of the sustainable livelihoods framework can be used as a tool to conceptualise key points where linkages between any 2 or all 3 elements may exist. The gender component of the study used a stakeholder consultation to identify the key areas (in South Africa) where data and an improved understanding were required. Both approaches enabled the selection of one research hypothesis to act as a lens through which to quantify and explore a wide range of issues / sub-linkages. In each case, the process of developing the methodology led to the expansion of originally quantitative questions into combined quantitative / qualitative questions or, for those areas deemed to be too sensitive or complex for this approach, participatory research techniques were introduced into the Refined Methodology.

Involvement of stakeholders, research specialists and community researchers during the process
The development of a contextually appropriate survey and participatory methodology must involve stakeholders, research specialists and community researchers at several stages during the process. The participatory approach used in both components of this study comprised a focused literature review undertaken by experts in the field / country, definition of a contextually relevant research hypothesis, development of an initial methodology, community testing (particularly of the questionnaire, which may require several mini tests) and a workshop (involving key stakeholders and community

researchers). This approach added richness to the process and was highly effective in the development and refinement of a combined quantitative / qualitative methodology for exploring gender-energy-poverty linkages and education-energy-poverty linkages.

5.2 GENDER SPECIFIC CONCLUSIONS

Lack of research on gender-energy-poverty issues in poor households
There is a general lack of detailed research, quantitative or qualitative, on gender-energy-poverty issues in poor households; this was widely considered to be necessary in order to attempt to address the many unanswered questions.

Changing gender landscape
The gender landscape in South Africa has changed and is continuing to change, and the policy implications of this are not well understood or recognised.

Access to electricity more widespread than expected
Almost all household needs amongst those interviewed were being provided by electricity. This finding is not consistent with the current knowledge and ideas about energy use in poor households in formal settlements in South Africa that assumes a continued dependence on paraffin. This has implications for energy demand and supply models.

Affordability of electricity
The proportion of households that have problems with electricity purchasing is significant and this may affect electricity consumption. This may also lead to periods of 'energy poverty' and associated hardship for some households.

Paraffin used for space heating
Paraffin maintains its position as the preferred fuel for space heating (the reasons given were that this enables both space heating and water heating, and also some cooking, and that it is less expensive than electricity). Thus, the level of confidence for the assumption that indoor air pollution is significantly reduced in electrified homes needs to be revisited.

High level of appliance ownership
The level of appliance ownership was higher than anticipated at the outset of the survey, with a high number of households owning a range of appliances (for cooking, storage and entertainment). This has implications for electricity consumption and, if appliances are readily accessible and affordable, to the extent and rate at which fuel switching may occur following electrification. Further studies in this area are required.

No gender bias regarding appliance acquisition
The evidence does not support the perception that appliance purchases are biased towards the preferences of the men in the house, and thus the assumption that the women's burden is not alleviated to the extent that it could be through electrification or electrical purchase. Decisions are taken jointly and often include other family members. Further work is required to determine whether this pattern is also observed in poor households in other types of electrified settlements.

Cooking not considered a burden by many of the women interviewed
This is a key area where greater clarity is required as many electrification programmes and energy policies are formulated around this issue. The issue of exactly what activities are considered by women and men to be burdens and how these relate to energy choice and availability requires further exploration.

5.3 EDUCATION SPECIFIC CONCLUSIONS

Incorporating household level analysis
The field trial revealed the importance of expanding the methodology to incorporate household level analyses of energy services. This would enable greater complexity of findings with regard to the human and social livelihood impacts of energy service provision. The focus on households as well as schools and the community would also provide a more holistic and synergistic use of the sustainable livelihood framework utilised under this research.

Appropriate training of field researchers.
Although experienced Researchers were employed to conduct the field trials under the project, training in the use of the specific participatory tools and sequencing of participatory methods is required. Lessons in *attitudes and behaviour* are also essential precursors to successful conduct of the research.

Guidance for future research.
The pilot test by its nature employed a limited range of research instruments and was designed to test the methodology not gather data. Hence to ensure that the complexity of information can be gained from the research there needs to be a clear understanding of the research instruments and interviews with a broader range of community groups and individuals than was undertaken in the pilot test.

Complexities of choice relating to resources, affordability and accessibility
Under the field trial the non-energised school had an electrical grid 50 metres away from the school building and 20 metres away from the only resident teacher. However, the grid could not be accessed due to a lack of resources in both the community and the public school to pay for this. Though modern energy was provided to the energised school, electricity was only used for lighting classes, dormitories and teachers houses and providing power for office equipment for a limited number of hours per day. The school continues to use firewood to prepare lunch for school children that could afford to pay. However, this was considered a great expense for the community. In addition even when schools acquire computers and other appliances, prohibitive maintenance costs deter use of these technologies. The effectiveness of energy in educational attainment will also be determined by how sustainable the education energy links are. This in turn is affected by factors such as the continued affordability of power and equipment.

Awareness of the benefits from energy
Overall results of the limited field test showed that respondents were very conscious of the potential benefits from the provision of modern energy and came up with a wide range of linkages that they felt would enable them to improve the quality of the

education provided. The field test also revealed that there was a lack of understanding regarding the decision-making process.

Sustainable livelihoods approach guides methodology framework

In the workshop there was agreement on the importance of the conceptual links between education, energy and poverty. The Sustainable Livelihoods and the Energy Ladder analysis[17], are important conceptual ideas that embody the methodology framework and provide guidance on the potential of energy services to promote change on local level.

[17] Analysis of the Energy Ladder was provided in Phase 1 of the project under Appendix 6 (pages 9 and 10).

6 Recommendations

6.1 GLOBAL RECOMMENDATIONS

Quantitative and Qualitative Analysis
Field tests revealed the importance of combining the quantitative questions with more probing qualitative analysis during consultation with key stakeholders and community members. The combination is necessary to understand and thus develop policy responses on the energy-poverty nexus. Use of both the gender and education methodologies have enabled identification of the types of issues and questions most appropriate for quantitative research and those that are best explored in a way that generates comment and free form responses. It is therefore recommended that future research in these areas should adopt both quantitative and qualitative analysis.

Local Participation is key
The use of participatory tools and techniques to collect and assess community perceptions and interests on the energy-poverty linkages is necessary for providing a context for further research on a local level. Participation is a key element of any local level investigation that involves making a judgement on what is good for a given community and cannot be done without consultation with community members whose needs and interests must be recognised and reflected throughout. It is essential that the methodologies are adapted to suit local contexts and that Researchers are familiar with the environment and have the support of local Gatekeepers/Informants to highlight local idiosyncrasies and conditions.

Advisory Committees and Thematic Workshops to maintain momentum
Global advisory committees comprising the key stakeholders responsible for linking education-energy-poverty and gender-energy-poverty objectives should be established in order that synergies between the studies and complementary policies can be designed and implemented. As a precursor to establishing these committees, it is recommended that workshop are held in both these thematic areas and with the aim of ensuring transfer of methodologies, findings and lessons learned between current research / monitoring & evaluation projects (for gender-energy-poverty, this would as a minimum involve researchers from this project, recently completed World Bank 'ENPOGEN' project and the 3 new DFID KaR projects).

6.2 GENDER SPECIFIC RECOMMENDATIONS

Participation of men is an essential element
Within gender-focused research, the inclusion of men at all stages and on all relevant issues, is a vital element of ensuring that policies, implementation and development initiatives do not create negative impacts on men or women. However, the participation of men in research and projects in areas traditionally thought of the women's domain and vice versa still requires many barriers to be overcome. The involvement of men and

women is essential in providing sustainable change in areas where gender inequality needs to be addressed. Careful planning and the tailoring of quantitative methodologies and qualitative information gathering are likely to be needed to ensure appropriate and constructive engagement with men and women.

Gender landscape needs to be constantly monitored
Assumptions and linkages may no longer be valid if the gender landscape is rapidly changing. These changes and the consequences need to be recognised by policy makers, and the researchers whose work often underpins policy design. This study has observed that a significant shift in the position, roles and responsibilities of women has occurred in South Africa over the last ten years, and that current policies may not have acknowledged these changes.

Continued research to address practical gender needs
Much of the early gender research focused on addressing practical gender needs (aimed at alleviating the burden associated with those tasks that were the primary responsibility of women, such as fuel and water management, cooking and other household chores). There has been a significant and vital shift to addressing the strategic gender interests of women (aimed at securing long term solutions, e.g. eliminating violence against women, securing women's human rights, to address gender gaps and equality). This study has observed that the assumed 'burden' of cooking and household chores may be somewhat misplaced and the acquisition of electrical appliances is the natural consequence of electrification and women's own desire to reduce the time and energy used for household activities which they consider to be their specific responsibility. There is a continuing need for research in these areas to ensure that the desires of women in this regard are adequately facilitated by policy, and possibly market mechanisms (e.g. micro finance for appliance purchase).

6.3 EDUCATION SPECIFIC RECOMMENDATIONS

Focus on secondary schools and technology
It is recommended that additional indicators be developed to assess the impact of energy on education with a focus on secondary schools and the use of ICTs. It is further recommended that under the research a full piloting of the methodology be conducted in relation to specific countries identified in sub-Saharan Africa. A focus on technology, through ICTs and the use of computers will provide a more accurate picture of equipment use and its relationship to improved educational attainment, whilst providing useful information on access, equity at the secondary level. The impact of energy services on school-based ICT development can be easily monitored and evaluated to assess the cost and benefits to educational attainment. Additional energy service value can be gained through physical mapping of the resources across specific landscapes over time.

Linking with existing data
Existing data should be found and utilised so that the methodology is adapted properly to the local context. In Uganda, data from education (national drop out rates, retention rates, pass rates, etc,) from the census (economic activities, population densities, numbers of schools, etc.) and from the utilities (electrification timetables) should be used.

Continued collaboration with stakeholders
This project has been able to engage education specialists and for the first time gain their commitment to investigate these issues. This is a key result of the project and this group of keen cross-sector specialists should be encouraged to continue this collaboration. In addition, many of those whom participated in the peer review workshop were from Ugandan Government departments and this cross-departmental co-ordination of efforts will provide synergy and influence at the policy level. It is recommended that the ministries, education and energy specialists and other stakeholders (e.g. teachers) should be brought together in the form of a committee to ensure the momentum generated from this project is built upon in the future.

Joined up projects
The World Bank supported Energy for Rural Transformation programme plan links energy and education initiatives within Uganda. The methodology that has been developed could support and promote these links, as the research would provide important information. This information could be used for monitoring and evaluation of project progress particularly with regard to new technologies e.g. ICT's and its links to educational attainment. It is hoped that co-ordination between projects will enhance the information available.

Research to input into national strategies
Additional research is needed to input into national cross-sectoral implementation strategies within Uganda. Further research on the obstacles, successes and potential for joining-up the various within Uganda would be useful. This could collate findings on the education-energy-poverty nexus, and enable broader participation and understanding of the linkages.

6.4 AREAS IDENTIFIED FOR FURTHER RESEARCH

At the project level, the following research areas have been identified. In South Africa, many of these would address issues acknowledged by policy makers during the stakeholder consultation.

The potential research areas are outlined below in Tables 6.1 for education and 6.2 for gender.

TABLE 6.1
EDUCATION-ENERGY-POVERTY – AREAS FOR FURTHER RESEARCH

Focused study on the links between ICT and educational attainment.
This study would examine the scope of ICT infrastructure, not only in Uganda but also across sub-Saharan Africa. It would explore the gendered dimensions of access to ICTs in secondary schools and colleges. Any study examining ICTs should also include a costing of the energy services required to support educational attainment at source (schools) and an examination of the energy infrastructure provided through physical mapping of current services.

Measuring impacts of energy services on educational attainment at the household level. The emphasis of this study would be regional and would examine ways in

which all household members benefit from energy services related to education.

TABLE 6.2
GENDER-ENERGY-POVERTY – AREAS FOR FURTHER RESEARCH

Study on the gender-energy-poverty nexus in South Africa is urgently required. The gender landscape in households is changing in South Africa. Women seem to have a stronger role in some areas, but why? And how exactly is it changing? And are policies still designed around the findings of outdated studies?

What are the main burdens faced by women, and how can electrical appliances benefit women in areas that they consider a burden?
The current lack of clarity on the issue of what tasks women in fact consider their main burdens has potentially major implications for energy policy and electrification practice.

Do men face particular energy-related 'burdens'? What are these and what can be done about them?
Similar questions need to be asked around the specific energy-related burdens faced by men.

What are the gender roles and responsibilities in decision-making around the prioritisation, selection and purchase of household electrical appliances, and in household budgeting? What are the benefits that actually result from these appliance purchases?
This would make a valuable contribution to understanding how women and men prioritise their need for, and expenditure on, electrical appliances, and the likely timing of appliance acquisition in relation to the introduction of electricity.

Impact of HIV/AIDS on gender-energy-poverty linkages
Further research is required around the HIV/AIDS issue and its impact on gender-energy-poverty linkages.

Related research issues that have been identified
How does the provision of basic electricity impact on the lives and livelihoods of poor households?
How does electrification influence the availability of other fuels / energy, and to what extent does fuel switching occur (or not) in electrified households?
Are there fundamentals problems with the use of the term 'gender' and how does this impact on whether women and men become involved?

Further details on these projects are provided in Appendix D.

Energy Use to Reduce Poverty - Final Report for Phase 1: (R8020)

A report produced for Department for International Development

Appendices

Issue 2
October 2004

AEA Technology
Future Energy Solutions

Appendices

CONTENTS

Appendix A **A review of Energy, Poverty and Education**
Appendix B **Documents from work on Gender in South Africa**

B1 Review of key reports and methodologies for Gender-Energy-Poverty Linkages (South Africa)
B2 Stakeholder Consultation – South Africa
B3 Findings from the field trial and initial comments on methodology
B4 Summary Report from Methodology Workshop on Gender-Energy-Poverty Linkages (South Africa)

Appendix C **Documents from work on Education in Uganda**
C1 Review of Education Literature & Activities: Uganda
C2 Uganda Workshop Report

Appendix D **Detailed research areas for further work**

Appendix E **Final Methodologies**
E1 Gender methodology
E2 Education methodology

Appendix A

CONTENTS

A review of Energy Poverty and Education

ENERGY, POVERTY AND EDUCATION

A REVIEW

Kate Meadows
March 2003

AEA Technology
Future Energy Solutions

EXECUTIVE SUMMARY 4

0.1 INTRODUCTION 7

0.2 METHODOLOGY 7

1. An overview of education priorities with an assessment of modern energy in respect to these priorities 8

1.1 GLOBAL EDUCATION PRIORITIES 8
1.1.1 Introduction 8
1.1.2 Review of key education priorities 9
1.2 AN OVERVIEW OF EDUCATION PRIORITIES IN SOUTH AFRICA 18
1.2.1 Electrification of South African schools 19
1.2.2 Curriculum 2005 19
1.2.3 Conclusions 20
1.3 AN OVERVIEW OF EDUCATION PRIORITIES IN CENTRAL AND EASTERN 20

2. A review of the current evidence of linkages of energy and education. 21

2.1 ENERGY NEEDS IN SCHOOLS 21
2.2 TYPES OF ENERGY USED IN SCHOOLS 22
2.3 ENERGY USE IN SCHOOLS AND ASSOCIATED COSTS 23
2.3.1Modern energy costs for the urban poor and rural communities around the globe 23
2.3.2 A CASE STUDY FROM SOUTH AFRICA 23
INSTALLATION COSTS 23
MAINTENANCE COSTS AND BILLS 23
EQUIPMENT COSTS 24
2.4 IMPACT OF ENERGY USE ON EDUCATIONAL OUTCOMES 24
2.4.1 Lights 25
2.4.2 Heating 25
2.4.3 Water heating, refrigeration, kettles and cookers 25
2.4.4 AUDIO-VISUAL EQUIPMENT (TVS, VCRS, DECODERS, RADIOS, OVERHEAD PROJECTORS) 26
2.4.5 Laboratory equipment 27
2.4.6 Computers, printers and ICTs 28
2.4.7 Telephones and faxes 29
2.4.8 Skills development equipment 29
2.4.9 Photocopiers 29
2.4.10 Security systems 30
2.5 EDUCATION, ENERGY AND ECONOMIC GROWTH 30
2.6 EDUCATION ABOUT MODERN ENERGY 31

3 Assessment of linkages 32

3.1 DO THEY REALLY EXIST AND WHAT IS THE EVIDENCE? 32
3.2 ARE THEY DIRECT / INDIRECT, TENUOUS, OR ARE THESE 'LINKAGES' JUST ASSUMPTIONS? 33
3.3 IS THERE QUALITATIVE OR QUANTITATIVE EVIDENCE TO SUPPORT THE LINKAGES? 34
3.4 THE 'DANGERS' OF RAPID ELECTRIFICATION ON EDUCATION – LEAPFROGGING DEVELOPMENT AND THE CREATION OF INEQUITY 34

4 Equity in access to modern education tools, in particular ICTs and teacher retention in rural areas 35

4.1 EQUITY IN ACCESS TO MODERN EDUCATION TOOLS PARTICULARLY ICT 35
4.1.1 Argument for embracing ICTs 35
4.1.2 Cautionary arguments relating to access and equity 36
4.1.3 ICTs in South Africa 37
4.2 ENERGY AND MANAGEMENT OF EDUCATION RESOURCES ... 38
4.3 TEACHER RETENTION IN RURAL AREAS AND MODERN ENERGY 38
4.3.1 Global rural-urban migration trends 38
4.3.2 The problems of teacher retention in rural areas 39
4.3.3 Modern energy's role in attracting and retaining teachers 40

5 Recommendations 40

REFERENCES AND PERSONAL COMMUNICATIONS/CONTACTS LIST 42

EXECUTIVE SUMMARY

This paper reviews information on the linkages between energy, poverty and education.

1. **An overview of education priorities with an assessment of modern energy in terms of education priorities**.

A number of global education priorities are identified in the literature, some being more universal than others. These include:

- Basic education for all
- Improved educational quality
- Equal access to education particularly for girls
- The provision of adequate materials and infrastructure
- Fiscal limitations
- Poverty as an obstacle to learning
- Teacher training
- Teachers' working conditions
- Science and technology education
- The provision of modern energy and associated education technology
- Political agendas
- Adult education
- Environmental education
- HIV / AIDS

Linkages between these global education priorities and modern energy are viewed in terms of those priorities where modern energy would have no impact, those where modern energy may have some impact and those where modern energy would make the realization of the priority a possibility, or at least enhance it significantly. Equal access to education and fiscal constraints were cited as priorities that would not be aided by the provision of modern energy although there are some arguments concerning evening classes for women after daily tasks facilitated by improved lighting. Access to basic education for all, improved education quality, material and infrastructural provision, political agendas, adult education, environmental education and education around the issue of HIV and AIDs were all cited as having some aspect that would be enhanced through the provision of modern energy. The provision of modern energy was viewed as essential in addressing poverty, providing improved teacher training, improving the working condition for teachers and in implementing quality science and technology education.

A review of education priorities in South Africa outlines steps taken to unite diversified education systems following democratization in 1994. The South African Education Department's current priorities are reviewed in relation to modern energy and it is determined that the fulfillment of a number of them would require access to modern energy, in particular in implementing their technology learning area of Curriculum 2005. Through

South Africa's main electricity provider, Eskom, there has been an effort to electrify schools in South Africa, though a large backlog still remains.

An introduction to education priorities in Central and East Africa shows the provision of basic education for all and an improvement in science and technology education as top priorities. The provision of quality science and technology education is dependent to some degree on the provision of modern energy, something that is lacking in a large number of schools in the regions.

2. A review of the current evidence of linkages of energy and education

Energy needs identified in schools include lights, heating facilities, refrigeration, kettles, cookers, water heating facilities, audio-visual equipment, laboratory equipment, computers and printers, telephones and faxes, skills development equipment, photocopiers and security systems. Types of energy cited used in schools includes grid electricity, photovoltaic (solar) systems, diesel generator sets, gas, paraffin, and wood. Other forms of energy are used in households around the world and while this review has shown that they are not mentioned as used in schools, they have seen to be used by this author particularly in post stress situations like Rwanda post genocide. These include liquefied petroleum gas (LPG), kerosene, candles and dung.

The impact of energy on educational outcomes is viewed in relation to those items where modern energy was identified as necessary or desirable in schools. There are mixed views as to what the impacts of modern energy on education are. Some successful cases are cited, such as prolonged hours with the provision of lighting, the successful use of radio and TV in extending the benefits of education, a certain relief in the domestic burden on girls allowing them more study time and the effective implementation of technology education. Some of these studies, however, have been regarded with skepticism by educationalists. Moreover, there are also areas of uncertainty, where modern energy is described as obviously desirable, but not a necessity.

Direct links are readily drawn between education and economic growth and development and similarly, between modern energy and economic growth and development. The linkages between energy, education and development, however, are more tenuous. In some sectors, such as the use of ICTs and effective science and technology education, linkages appear more obvious.

3. Assessment of linkages

The literature indicates that modern energy alone is insufficient to have any impact on educational outcomes, but that it is the effective use of appliances and teaching aids that will in turn improve education. Direct, quantitative linkages between energy provision and improved educational outcomes are rare. Linkages are largely tenuous and qualitative. Where cases are cited linking modern energy provision and improved results, causality is not always obvious. There are areas where logic implies the links should be there, for example

in the use of ICTs and in improving science and technology education, but no quantitative research has been done to demonstrate these linkages.

There is some danger of 'leapfrogging' development with rapid electrification and energy transition in general. The provision of inappropriate appliances, the installation of systems that can not be easily repaired, lack of simultaneous teacher training with the provision of modern teaching aids and the inability to pay bills, are all examples cited where electrification may have been detrimental. A considered approach must be adopted to ensure that any electrification scheme goes ahead in a manner that will indeed improve education opportunities.

4. Review of the debate relating to equity in access to modern education tools, in particular ICTs and teacher retention in rural areas

Two views exist regarding the implementation of ICTs in schools. One is that no country can afford to be left behind in the global information and technology revolution and that all countries should embrace ICTs in their education systems. The second view is one of caution, which suggests that the implementation of ICTs may widen certain access and equity gaps. For example the high cost of ICTs means that they are likely to be installed in only some schools and in the past this has tended to be the already privileged schools, thus widening socio-economic gaps. Where girls do not attend school in the same number as boys, the implementation of ICTs in schools may further widen the gaps that inequity in access along gender lines in the education sector has generated.

Availability of modern energy in developing countries varies considerably, and this factor alone will greatly influence the use and prioritization of modern energy in schools. The general debate in the literature is that while modern energy is highly desirable, more pressing issues in education must be addressed first, and that until these are addressed any positive impacts of energy are likely to be limited.

There is a dramatic global trend in rural-urban migration, and there are arguments that state that the provision of modern energy in rural areas will stem this tide and other arguments that state the provision of modern energy will do little to retain people in rural areas. It is, however, universally agreed that the provision of modern energy does substantially improve living conditions.

A number of global examples are cited that demonstrate that the lot of a rural teacher is harder than that of an urban teacher. Many countries have difficulties in attracting and retaining quality teachers to rural areas. While no direct link is made (i.e. quantitative data), it might be assumed that the provision of modern energy would serve to improve working and living conditions for rural teachers and that this in turn could aid in attracting and retaining teachers in rural areas.

5. Recommendations

It is felt the provision of modern energy is a fundamental requirement to meeting certain education objectives. In other areas, where is may not be fundamental, it is most certainly highly desired. However, there is consensus that there are a number of pressing issues that must be addressed in education and that of modern energy is not necessarily the most urgent. Frequently social or infrastructural issues must be met as a prerequisite for any electrification scheme to add value.

It is suggested that given recent electrification programmes in South Africa, this would make a good study area in exploring potential direct and quantitative linkages between modern energy and educational output. Suggested measures include teacher turnover, results, literacy, school attendance and the use of the school for after-hours learning.

1 INTRODUCTION

This paper reviews information on the linkages between energy, poverty and education. Emphasis is placed on modern energy, in particular electricity. Energy and education have long been recognised, in their individual capacities, as closely linked to development (DFID 2002, Todaro 1997, UNDP 1997, World Bank 1995a). Direct linkages between modern energy and education, and their impact on development and poverty alleviation have not been explored to the same extent. Here the literature is reviewed and an attempt is made at uncovering the existence and significance of linkages between these three areas.

0.2 METHODOLOGY

Methodologies included an extensive literature search on electronic databases for papers or information on linkages between energy, education, poverty, and development. Particularly useful was material from the Energy and Development Research Centre (EDRC), based at the University of Cape Town. Consultation was also carried out with relevant parties in the education and energy sectors. However, there is a lack of consolidated and comprehensive research exploring linkages between these issues. Consequently much of this review is drawn from individual case studies in South Africa that, owing to the combined circumstances of having the mostly rapidly implemented modern energy and reconstruction process in the world and one of the most prolific and prestigious Energy Research centers, provides comprehensive literature on which to draw.[1] The South African material nonetheless is considered with examples from across the developing world including Central and East Africa from which a 'good fit' comparative analysis can be made. As well as reflecting the authors education and infrastructure development experience in these regions the Central and East and South Africa comparisons are considered more meaningful than cross continent

[1] Therefore it was also considered that South Africa would be an appropriate starting point to conduct any further research arising from this review for reasons outlined below.

comparisons although these offer a broader comparative perspective. Moreover, the Energy Services for Rural Institutions (ESRI) project run by the UK Department for International Development (DFID) Knowledge and Research Programme focuses on East and South Africa.

Following the completion of an early draft of this review the document was then distributed to education and energy specialists for peer review and comment. These comments were then included in the review following the East and South Africa findings review meeting on 25th March 2003.

1. An overview of education priorities with an assessment of modern energy in respect to these priorities

1.1 GLOBAL EDUCATION PRIORITIES

1.1.1 Introduction

Education is viewed as critical for economic growth and poverty reduction (DFID 2002, Todaro 1997, UNDP 1997, Hallak 1990, World Bank 1995a). Linkages between education, economic growth and poverty reduction are hinged on the contribution of education in increasing productivity among the poor through reduced fertility, improved health, the acquisition of rationalistic and empirical attitudes, the development of cognitive abilities and the conferral of skills (Eiseman 1988). More generally education may contribute to development through stimulating a culture of entrepreneurship, improved civil institutions, the development of national capacity, and good governance (World Bank 1995a). Viewed as the basis for all factors contributing to human resource development there is little wonder that most countries place major emphasis on educational policy, in particular, in drawing up their plans for development (Hallak 1990). This is particularly true of developing nations who in the 1960s and 1970s made a significant effort to improve education both in promoting it as a basic human right and in forwarding their economic and social development aims. Education is still recognized as one of the most pressing needs in developing countries (ActionAid 2003). However, increasing population pressures and decreasing government budgets means there is a need to prioritise government spending, both at a national level in terms of budget allocation to education, and within the education system itself. Education priorities by their nature are forward thinking, and serve to steer learners towards the kind of society envisaged and desired by a nation's government in the future (Dalin and Rust 1996).

A number of global education priorities are identified in the literature (source are viewed in section 1.1.b in relation to each priority), some being more universal than others. These include:

- Basic education for all
- Improved educational quality
- Equal access to education particularly for girls
- The provision of adequate materials and infrastructure
- Fiscal limitations

- Poverty as an obstacle to learning
- Teacher training
- Teachers' working conditions
- Science and technology education
- The provision of modern energy and associated technology
- Political agendas
- Adult education
- Environmental education
- HIV / AIDS

Each of these is introduced below. In section 1.1.c. the relevance of modern energy to meeting each these priorities is considered.

1.1.2 Review of key education priorities

1.1.2a Basic education for all

The most pressing need in education around the globe remains the extension of basic education to all (UNDP 1989). 'Basic education for all' was the number one priority of the international community following the 1990 international conference in Thailand organized by Unesco, UNDP, Unicef and the World Bank (Hallak 1990, Buchert 1997). Following a concerted effort by governments, most countries in the last 20 years have achieved a dramatic increase in primary school enrolment ratios, with global averages going from 36% in 1960 to 75% in 1985 (Hallak 1990). In Africa, Asia, the Middle East and Latin America between 1960 and 1990 enrolments increased from 163 million to 440 million, predominantly in primary education. Growing population numbers are placing additional pressure on schools. The number of 6 to 11 year olds not in school is on the increase and is estimated to be 162 million by 2015 (World Bank 1995a). Africa still lags behind the rest of the globe with only 67% of its primary school-aged children in school (Todaro 1997). Some sub-Saharan countries experienced decreases in enrolment in the late 1980s and early 1990s following an economic slump, such as Botswana, Mozambique, Lesotho and Tanzania (ADB 2003, ADEA 2001).

While some gains have been made in improving enrolment, more than one third of the world's children are still denied a chance of the basic five years of primary education to achieve literacy (ACTIONAID 2003). The year 2000 deadline for achieving basic education for all, passed without this goal being achieved and therefore this still remains a global priority. In the Millennium Development Goals contained in the Millennium Declaration adopted by the United Nations at the Millennium summit in 2000, the attainment of universal primary school education for all was a central aim, and a new deadline of 2015 was agreed (ADB 2003).

1.1.2b Improved educational quality

Quality of education is generally lowest in developing countries where education systems are described as ineffectual, and where learners consistently have lower achievement levels (World Bank 1995a, UNDP 1989). In some countries, even after a number of years of

education, children still cannot read or write (ACTIONAID 2003). Lagging reform processes can hinder growth and development, the converse being evident in East Asia where heavy investment in human capital through education has done much to alleviate poverty and promote development. In the late 1980s average repetition rates at the primary level in Africa, Asia and Latin America were 21%, 9% and 11% respectively, with averages for secondary school at 17% for Africa and 10% for Asia and Latin America (UNDP 1989). These problems are attributed to poor quality teaching, inadequate textbooks and materials, language inadequacies and other external social and economic pressures (UNDP 1989).

Following on from the overriding principle of universal education for all, among the overall goals of 'Basic Education for All' was improved educational quality and effectiveness (Buchert 1997). This either still remains a top priority for countries around the globe, or in some instances have adopted improved quality as a new priority. Tanzania recently revised its top education priorities from issues of access, equity and relevance, to that of improving quality, as has Malawi (ACTIONAID 2003, ADEA 2001, Buchert 1997). These moves reflect a global trend.

Areas for improvement in educational quality are in teaching quality, textbooks and infrastructure such as school buildings. An earlier move in some Asian schools to improve quality by simply increasing the number of teachers, improving teacher to pupil ratios in an attempt to improve quality, failed to have any positive impact on educational outputs (Postlethwaite and Thomas 1980).

The choice between expansion, in providing education to all children, and improving education quality, is often conflicting (Hallak 1990). Massive expansion is frequently at the cost of quality and in such instances achievement levels can drop so low that the investment yields little return (UNDP 1989). Education for all and improved quality of education are top global education priorities, and governments must devise policies that address both these priorities, ensuring one is not at the expense of the other.

1.1.2c Equal access to education

While education has obvious positive aspects, it can also perpetuate inequalities in society, imparting values and attitudes that do not promote development (Thirwall 1990). Schooling is dispersed on a highly discriminatory basis, historically favouring urban males and the wealthier sectors (UNDP 1989). Equity in access to education largely affects the poor; in particular disadvantaged groups such as ethnic minorities, nomads, refugees, rural communities, girls, street children and working children (ADEA 2001, World Bank 1995a). Inequity in access to education play out in continued inequalities throughout people's lives. Inequitable access to education has long been recognized as a key development issue, and despite major efforts to address the issue; it remains an important priority in a number of countries.

Access to education for women has been regarded as a particularly important indicator of social progress. Education for women is seen as a key contributor in family planning, child

health and the integration of women into the workforce (Graham-Brown 1991). While most governments can boast marked increases in enrolment by girls, figures on the whole lag behind those of boys (Graham-Brown 1991). In developing countries girls receive less education than boys and in a study of 66 out of 108 developing countries, girl's enrolment was at least 10% below that of boys (Todaro 1997). Despite global improvements in female enrolment since the 1970s, in Afghanistan, Nepal and Pakistan the gap between male and female enrolment has in fact widened (Hallak 1990). When the pinch of school fees and general poverty are felt, it is invariably the girls who are removed from school, as has been shown particularly to be the case in China (Child Labour Bulletin 1996). The education of girls and women for some countries has long been an education priority, and must remain so. It is recognized, in particular among developing countries, that previously set goals have not been met and this must continue to be a global education priority, not only on ethical grounds, but also on the widely recognized critical role of women in development (Hallak 1990). In a few instances female enrolment exceeds that of males. This is usually due to conflict, for example in El Salvador or due to traditional economies that prevent boys from attending formal schooling, such as cattle herding by boys in Lesotho (Graham-Brown 1991).

Racial and social inequalities in access to education also need to be addressed. Zimbabwe and South Africa have had some success in addressing racial inequalities, but social inequalities are far harder to eradicate (Graham-Brown 1991). Education has not been immune to the emergence of new class structures, albeit no longer divided along race lines. It is a known fact that in developed countries a student's performance correlates with their parent's socio-economic position, something developing countries should strive to avoid (Hallak 1990).

It is felt that policies are needed to remedy access imbalances, be they class, racial, rural-urban or gender based, and that addressing these inequalities would have multi-beneficial effects (Todaro 1997). Equal access to primary and secondary education for boys and girls by 2005 is one of the Millennium Development Goals (ACTIONAID 2003, DFID 2002). Equal access remains a global education priority.

1.1.2d The provision of adequate materials and infrastructure

Leaking roofs, lack of lights, lack of water and sanitation are all described as common problems in schools in Central America and Africa (Graham-Brown 1991). In Indonesia school buildings are frequently used by more than one school, with a heavy maintenance toll on infrastructure (Beeby 1979). Adequate school buildings are cited as a major priority, where it is felt reduced class numbers, a more positive surrounding and improved morale associated with functional buildings would all contribute to reducing dropout rates and improving educational standards (Hallak 1990).

Textbooks are cited as a major priority and one report suggests that the adequate provision of textbooks would have a greater impact in raising standards than improvements in teacher to pupil ratios (Hallak 1990). Another study holds adequate textbooks as possibly more important than improved teacher training, and certainly one that would have a more

immediate impact (Eiseman 1988). Textbooks are generally lacking in schools in developing countries, and at one in five schools visited in Indonesia not one child had a textbook (Beeby 1979). In Africa poor system management is blamed for the loss of 65% of textbooks a year during warehousing and transportation (ADEA 2001). It is not simply the supply of textbooks, but the quality of the content that is important. In the Asean region in the 1980s a special effort was made in training authors in textbook writing in an attempt to improve the quality of local textbooks (Postlethwaite and Thomas 1980).

In Indonesia in the late 1970s classes were found to have only 5-6 items of equipment, for example paper, chalk, a geographical globe, a poster and a map (Beeby 1979). Expenditures on teaching materials were less than $1 per primary student in Ghana, Bangladesh, Botswana and Chile in 1990 (Graham-Brown 1991). In addition to a general lack, materials often do not reach remote schools or do so too far into the school year to have any positive impact (UNDP 1989). Addressing major infrastructural and material inadequacies is viewed as a priority.

1.1.2e Fiscal limitations

In many developing countries fiscal capabilities are being stretched to their limits simply to maintain the educational status quo, with growing population numbers and increased pressure on resources there is frequently less money available per capita for education (UNDP 1989). In some instances governments are not managing to maintain education budgets and between 1975 and 1985 the proportion of educational expenditure in Africa was almost halved from 7.6% to 4.2% (Graham-Brown 1991). In Latin America and the Caribbean it fell even more sharply from 4.4% to 1.8%. More recently in the 1990s there has been acceleration in public expenditures on education in developing countries with educational budgets in many third world nations absorbing 15% to 27% of national budgets (Todaro 1997). However, the per capita expenditure on education in developing nations still remains well below half that of developed nations (Todaro 1997, Thirwall 1990). In addressing their priority of improving the quality of education, the Tanzanian government has highlighted the associated cost as a priority (Buchert 1997).

Teacher's salaries at the primary school level frequently make up the largest proportion of any education budget (Graham-Brown 1991, Hallak 1990). Despite this, salaries are commonly described as below subsistence and teachers are frequently forced to take on several jobs to survive, such as driving taxis or dealing in the black market (Graham-Brown 1991). A World Bank study of 18 sub-Saharan countries found teachers salaries had declined between 1980 and 1985, in some cases by as much as 10% (Graham-Brown 1991). In rural China communities are expected to pay at least half the salary of non-state appointed teachers, resulting in frequent underpayment (Child Labour Bulletin 1996). Poor salaries are frequently cited as a central issue in attracting and retaining quality teachers. It is felt better salaries would improve the quality of teaching staff and in turn improve educational outputs.

In addressing any of the education priorities there are associated costs, which means that the lack of adequate funding must be viewed, in itself, as a priority issue in education.

1.1.2f Poverty as an obstacle to learning

An increasing lack of government funding leaves schools with a choice of going without resources or seeking them from the community. For instance, in some areas in Sudan, pupils were required to provide their own desks and chairs (Graham-Brown 1991). Acute poverty limits choices in families about how to use their income, often leaving little room for spending on education. Increasingly parents must make larger contributions to school materials, building schemes and textbooks, which is not always possible, and in turn this financial pressure on communities and families is cited as a reason for dropping enrolments figures in Chile and Costa Rica, for instance (Graham-Brown 1991). A dramatic drop in the Tanzania government's education budget in 1990, due to an economic crisis meant 57% of school expenses fell on parents and the country experienced a simultaneous drop in enrolment. Since then budget figures in Tanzania have changed for the better, with an associated increase in enrolment, clearly demonstrating the link between the cost of education and enrolment (ADEA 2001).

In the 1980s dropping enrolment figures in Africa were attributed to the need for children to enter the work force as early as possible to contribute to family income (UNDP 1989). Erratic attendance is frequently due to children having to work, in particular in rural agricultural areas. It is difficult and maybe even erroneous to persuade parents that education should be a priority when there is a direct link between children helping in the fields and economic gain (Graham-Brown 1991). In China it is estimated that as many as 5 million children work (Child Labour Bulletin 1996). Moreover, malnutrition and other frailty associated with poverty are said to affect children's ability to study (Graham-Brown 1991). What is evident is a vicious cycle, where education may alleviate poverty, but poverty prevents children attending school. Poverty alleviation must be viewed as a priority, and one that relates directly to education.

1.1.2g Teacher training

Lack of teacher training and poor teacher training is a serious problem, in particular in sub-Saharan African and Central America whose education systems function with large numbers of under-qualified teachers (Graham-Brown 1991). Investments in teacher training are essential and historically have not often been prioritized. Investment in teachers, in their training, support, working conditions and status is vital and their role in implementing educational policy is crucial, and no government can consider improving the quality of education without investing in its teachers (Hallak 1990). Teacher training has been shown to pay off significantly in improving education quality, but is a long-term investment (Hallak 1990). Studies in Indonesia demonstrate a clear link between improved teacher training and improved quality of education (Beeby 1979). In Bangladesh a group called the Bangladesh Rural Advancement Committee (BRAC) formed to oversee improvements in education. They made teacher training a top priority, often over the provision of basic infrastructure such as buildings and modern energy (ADEA 2001). Despite the lack of desks and books, in this case improved teacher quality saw a dramatic improvement in education outputs (ADEA 2001).

1.1.2h Working conditions of teachers

As population and enrolment numbers rise, teachers are expected to teach larger and larger classes. Classes in Central America are often as big as 60 to 100 students in primary schools (Graham-Brown 1991). In Guatemala 54% of schools have only one teacher and in Ecuador the figure is 85% for rural schools (Graham-Brown 1991). As they are often the only source of information (in the absence of textbooks) large class numbers are increasingly draining to teachers' mental and physical health. These factors, combined with poor salaries and frequently lowly status, means there is little incentive for good professionals to join the teaching profession and those that do, often suffer low morale. These factors contribute to reducing education quality and improvements in the working conditions of teachers would undoubtedly improve teaching and in turn educational outputs. In light of this it is viewed by some cases as an educational priority.

1.1.2i Science and technology education

The world is currently going through a paradigm shift with rapid technological advances and more than ever there is a feeling that educational priorities must be relevant to tomorrow's world, in order that all countries may participate in and benefit from technological advances. Changing technologies and economic reforms have created dramatic shifts in the structures of economies, industries and labour markets throughout the world. Rapid increases in knowledge and simultaneous changes in technology means there is a call for the education sector to prepare a work force that can meet economies' growing demands for adaptable workers who can readily acquire new skills. In addition to this, the education sector must also be able to support the continuous expansion of knowledge (World Bank 1995a).

In the current climate of accelerated technological development and change, education has a crucial role to play and will directly affect a developing country's ability to participate in the global arena and benefit from technological advances (Hallak 1990). There has been a shift away from academic education towards vocational and technical education as clearly seen in Rwanda (Butare 2002). It is imperative that a priority of education be to prepare students for living in a scientific and technological world. Tindimubana (1994) calls for a mobilisation of all available talent to focus on capacity building for the future, with both science and technology education at the forefront of this imperative.

The importance of science and technology in the school curriculum, from a utilitarian point of view, has long been recognized by developed and developing countries alike, and it remains a high priority in most countries (Lewin and Stuart 1991). Tanzania has as among its education priorities scientific, technological and vocational training at all levels (Buchert 1997). South Africa, Rwanda and Kenya have improved science and technology as education priorities (South African Department of Education 2003, Butare, Chikka 2003). In Nigeria in the late 1970s a science and education development strategy saw the establishment of science and technology schools with the dedicated task of producing effective manpower for Nigeria in these fields (Lewin and Stuart 1991). A review of the efficacy of these schools in the late 1980s declared that they were highly effective (Lewin and Stuart 1991). Brazil and

India had as a priority that that their education systems produce computer expertise in order to compete in global software production markets (UNDP 1989).

In light of global trends, improved science and technology teaching is a high education priority.

1.1.2k Provision of modern energy

Lithole's report from 1997 states that according to available information, more than 80% of schools in developing countries are without electricity, in rural areas the figure is as high as 95%. Efforts made in the area of improving electricity supply in developing countries testify to recognition of modern energy in improving all aspects of life (World Bank 1996). In the past 25 years electricity supplies were expanded to more than 1.3 billion people (World Bank 1996). Despite this impressive achievement, in 1996 efforts in Africa and Asia still lag behind population growth, which underscores the enormity of the task that still lies ahead (World Bank 1996). The 1990s saw the introduction and use of educational technologies that need modern energy, as a priority, and one that would make a large contribution to improving education quality (UNDP 1989).

In addressing technological advances in education, modern energy is necessary and this must therefore be addressed in achieving this priority of improving the use of and teaching of technology. Linkages between modern energy and education are reviewed in section 3.1.

1.1.2l Political agendas

Education is often used to develop a sense of nationalism and governments frequently push a political ideology through the instrument of education. For example education goals in North Korea in the 1980s were to establish a 'revolutionary and communist rising generation, armed solidly with the communist ideology'. In direct contrast, the education goals of South Korea were pitted against communism, and aimed to 'modernize based on traditional Korean values' (Thomas and Postlethwaite 1983). Tanzania's education policy during the 1970s was aimed at education for self-reliance as advocated by Nyerere's socialist government, and while this main theme was maintained in revising their priorities towards 2000, it was toned down (Buchert 1990). Recently the vice president of Tanzania, Ali Mohammed Shein, described education as 'essential in the whole process of democracy and good governance' (ADEA 2001). Newly independent countries frequently have as one of their education priorities the reinforcement of democracy and the formation of democratic individuals (Hawkridge *et al*. 1990). In Guatemala and El Salvador education was included in a broader effort to establish peace after years of civil war (ADEA 2001).

Todaro (1997) suggests that developing nations should re-orientate curricula in accordance with the real resource needs of the nation. Taiwan for example, in recognizing their limited access to natural resources, prioritised the development of industrial and technological skills and economic trade skills in their education system (Thomas and Postlethwaite 1983). Japan, a recognized economically successful nation, embraced in their education goals in the early 1970s the notion that people emerging from the education system should be 'prepared to

cope flexibly with the rapid progress in science and technology' (Thomas and Postlethwaite 1983). Political agendas inevitably steer education priorities, and can become priorities in them selves.

1.1.2m Adult education

Global estimations state that as many as 900 million adults are illiterate (ACTIONAID 2003). It is felt that adult literacy projects make a difference in the educational environment of children and should be given due priority by governments. Parallel programmes aimed at primary and adult education are synergistic and go a long way to increasing primary enrolment, where better educated parents make greater demands for instruction for their children, and in improving the overall educational experience of the child (Hallak 1990). It is felt that this parallel approach is better than focusing all efforts and attention on primary education, and adult education is a priority in many countries.

1.1.2n HIV and AIDS

The HIV and AIDS pandemic have affected supply and demand and the basic functioning of education systems, especially in Africa (ADEA 2001). A number of governments hope to address the problems of HIV and AIDS through their education systems, and as a result it is cited as an education priority (ADEA 2001, South African Government 2003). HIV/AIDs education is often delivered through the media on TV and radio programmes. The success to this approach is so substantive that DFID even supports such programmes in South Africa.

1.1.2o Environmental education

Education has a vital role to play in improving the relationship between people and the environment. We can no longer ignore major environmental issues such as excessive pollution and irresponsible industrialization in developed countries, and floods, famine and land degradation in developing countries. On a local level where the developing country livelihoods are dependent on the environment NR management is often taught in schools (Raiki District Uganda 2000ref). Environmental education, while not universally recognized as such, is cited by some studies as an education priority for the future (Hallak 1990).

1.1.3 Links between global education priorities and modern energy

1.1.3a Education priorities without any direct link to modern energy

Equal access to education does not appear to be a priority that would be assisted by the provision of modern energy. Some studies even suggest that the provision of electricity and associated appliances such as Information Communication Technologies (ICTs) may serve to increase access gaps (see Section 4.1). Similarly an improvement of national budget provision for education could not be positively related to modern energy. There may be some long term and indirect relationship resulting from development and economic improvement through energy provision, but that this would have a direct impact on budget allocation to educations cannot be certain.

1.1.3b Those priorities with a tenuous link to modern energy

While it may not appear immediately obvious, there is one connection between modern energy and access to basic education, primarily through the medium of distance learning. A number of cases are cited (see section 2.4) where radio and TV have had a positive impact on bringing education to those who previously lacked access. While it is generally agreed improvements in the quality of education come from upgrading teacher training and the provision of textbooks and materials, it can be argued that the effective use of teaching aids, associated with modern energy, may improve teaching quality. If the materials or infrastructure relate to modern energy, for example with the provision of electric stoves for home economics classes, then modern energy will naturally make this priority possible. Much of the infrastructure and material requirements discussed however are considerably more basic.

While modern energy itself will not propound a political ideology, the provision of electricity to schools may be used as a political showcase, and in addition electronic media may be used to promote a political ideology. A number of the current environmental issues relate to energy provision and it may be argued that the provision of modern energy could allow for a better understanding of environmental issues. Access to modern media would also keep schools informed of global environmental issues. This link however, is tenuous. The HIV / AIDS pandemic may be addressed on an educational front to some extent through modern media such as radio and TV and this could only be achieved if schools have access to these appliances and the necessary energy supply.

Extended light hours allow for adult education classes to be held in schools after sunset. The provision of modern energy may also relieve domestic pressure, in particular on women, allowing them in turn greater time to attend adult education classes. Adult education could however, and frequently does, go ahead in the absence of modern energy and conversely modern energy is supplied there is no empirical evidence to support adult education increases.

1.1.3c Priorities that may only be realized, or aided through, the provision of modern energy

Given the right condition modern energy can relieve domestic pressure, allow for better health, reduce fertility rates and encourage the development of small businesses (Meadows, 1998). There can be little doubt that modern energy would go a long way in reducing the poverty that frequently blocks adequate education. However, modern energy has been seen to exclude the poorest (Meadows 1998).

Teacher training may be enhanced through access to ICTs and modern media sources. Teacher training in the use of teaching aids would also go a long way in improving education outcomes (Butare 2002). Just as modern energy is associated with improved lifestyles, so would teachers' working conditions be improved through the provision of modern energy? In turn it might be argued that a modern energy supply might help in retaining teachers in rural areas, a recognized problem (see section 4.3). (Uganda 2002).

While there are some arguments that science education can be effective in the absence of modern energy, there is little doubt that it would enhance science teaching and that it is essential to effective technology education. Science and technology education are a major global education priority and for countries to be able to engage with the rest of the world in the arenas of science and technology, modern energy is a necessity in their schools.

1.2 AN OVERVIEW OF EDUCATION PRIORITIES IN SOUTH AFRICA

Education policy since the democratisation of South African in 1994 has been predominantly directed at the creation of a single, unified system of education for the country. South Africa's first democratic government inherited a divided and unequal education system with 19 departments separated on the basis of race, geography and ideology (South African Government 1996). Unification of the education system has largely been achieved through the South African Schools Act (No 84 of 1996) that relates to the organization and governance of schools and has made provision for the unification of the previously diverse schooling institutions. The intention has been to rationalise, standardise and make equitable the different institutional systems existing under the apartheid government.

The South African Department of Education's most recent list of strategic priorities, to be addressed in the next five years, is as follows (South African Department of Education 2003):

- Making their provincial system work by making co-operative government work.
- Breaking the back of illiteracy among adults and youths in five years.
- Developing schools as centres of community life.
- Ending conditions of physical degradation in South African schools.
- Ensuring the success of active learning through outcomes-based education.

- Creating a vibrant further education and training system to equip youth and adults to meet the social and economic needs of the 21st Century.
- Building a rational, seamless higher education system that grasps the intellectual and professional challenges facing South Africans in the 21st Century.
- Dealing urgently and purposefully with the HIV/AIDS emergency in and through the education and training system.

1.2.1 Electrification of South African schools

The initiative and impetus for universal electrification in South Africa, which largely relates to rural electrification, started in the 1980s and gained momentum with the African National Congress' (ANC) election slogan "electricity for all" in the first democratic elections in 1994 (Annecke 1998).

According to the Reconstruction and Development Programme (RDP) in 1994, 19 000 of black schools alone were without electricity (ANC 1994). The RDP identified the electrification of all schools in South Africa as a priority. The supply of electricity to rural schools was viewed as an essential policy objective by the new South African government following democratisation. It was felt the benefits of electrification were likely to be high and that the electrification of all schools was in keeping with the principles of democratisation, access, equity, and redress (Bezuidenhout 1998, Gordon 1997).

The South African Department of Education has had to balance efforts to improve energy provision to schools with other pressing demands upon their resources. Incentives to pursue the electrification of schools as a priority despite other infrastructure pressures include the fact that there has been some available foreign funding for off grid electrification and Eskom, South Africa's electricity service provider, has subsidised rural grid electrification (Cowan 1998). These funds were not available for other services.

1.2.2 Curriculum 2005

Access to technological and professional careers requiring a strong basis in mathematics and science have been described as denied to all but a few South Africans, largely because of the chronic inadequacy of teaching (ANC 1996). Sub-Saharan Africa is in the shortest supply in manpower in the fields of science and technology, in particular engineering. Africa has the lowest number of scientists and engineers in the world with only 53 per million population, while Japan and America have 3548 and 2685 per million, respectively (Karekezi and Ranja 1997). Education and training in science and technology are seen as a key priority by the South African government (South African Government 2002). This is apparent in considering their current priorities listed above that relate to 'creating an education and training system to equip youth and adults to meet the social and economic needs of the 21st Century' and 'in building a higher education system that grasps the intellectual and professional challenges facing South Africans in the 21st Century' (South African Department of Education 2003).

A further relevant priority is their pursuit of the out-comes based education programme: Curriculum 2005. Technology is one of the eight learning areas listed in the National Education Policy Act (No. 27 of 1996) for the new outcomes-based education model (South African Government 2002). One of the key aims of Curriculum 2005 and the outcomes based approach is to develop a human resource that will aid South Africa in becoming an internationally competitive country. Outcomes listed in the National Education Policy Act for the learning area of technology includes among others:

- that each learner be able to apply technological processes and skills using appropriate information and communications technology;
- learners be able to understand and apply relevant technological knowledge ethically and responsibly; and
- learners demonstrate an understanding of the inter-relationships between science, technology and socio-economics.

These listed outcomes imply a need for electrification. For the effective implementation of the learning area of technology it would appear that a diverse array of educational aids and tools are desirable.

1.2.3 Conclusions

A survey in 1994 showed that almost all children between the ages of 6 – 15 do attend school in South Africa but that most achieve poorly. An education priority is to shift from measures to keeping children in school to making sure they benefit from being there (ANC 1996). While a review of the South African Department of Education's priorities for the next five years gives no explicit reference to the electrification of schools it would appear that in at least five of their priority areas, electrification could potentially play a significant role. These include:

- Developing schools as centres of community life.
- Ending conditions of physical degradation in South African schools.
- Ensuring the success of active learning through outcomes-based education.
- Creating a vibrant further education and training system to equip youth and adults to meet the social and economic needs of the 21st Century.
- Building a rational, seamless higher education system that grasps the intellectual and professional challenge s facing South Africans in the 21st Century.

1.3 AN OVERVIEW OF EDUCATION PRIORITIES IN CENTRAL AND EASTERN AFRICA

Kenya is ranked as one of the least developed countries in the world, and was placed, in 1998, 137 out of 174 countries based on its Human Development Index (Save The Children 2003). Between 1963, independence, and 1984 primary school enrolment increased four-fold (Eisemon 1988). This upward trend in education is reflected in the increase in youth literacy rates (between the ages 15 – 24 years) in between 1990 and 2000 from 90% to 95%, an increase rate of 5.26% (ADB 2003). The dramatic push for the further expansion of primary

education involved the employment of 18 000 untrained teachers to enable schools to extend instruction by an extra year and also required teachers to donate some of their salary to a building fund (Eisemon 1988). Resources and capacity were not always available to meet these rapid increase demands and on the whole school development did not match enrolment increases. As a result teachers, parents and older students were all expected to become involved in building projects. It was generally felt that each step aimed at increasing access to primary schooling following independence was, at least temporarily, at the expense of upgrading the qualifications and quality of school teachers (Eisemon 1988). There is now a recognized shortage of qualified teachers in Kenya (Save The Children 2003). Other current education issues include inadequate supplies and materials, gender discrimination, lay off of teachers and the cost of education to the public (Save The Children 2003).

Currently, in keeping with the majority of developing countries, education accounts for the largest expenditure on Kenya's national budget (World Bank 1995a, Chikka 2003). In the 1970s education in Kenya was described as 'directional' with education priorities carefully aimed at achieving manpower requirements (Sheffield 1973). Today there is still, as is frequently the case in education priorities, a 'directional' slant to education priorities in Kenya, in particular with a drive to improving science and technology education (Chikka 2003). In addition to this universal primary education remains a top priority for the Kenya government (ACTIONAID 2003, Chikka 2003).

The improvement of science and technology teaching could most certainly, with attention to the associated provision of tools and qualified teachers, be positively impacted by the provision of modern energy. One of a number of schemes to improve modern energy availability across Kenya, which specifically relates to the provision of energy in the education sector is the Kenya Arid Lands Project, a World Bank project which provides low-cost loans for the purchase of energy equipment, such as wind-pumps or solar systems, for use in schools and clinics (World Bank 1996).

2. A review of the current evidence of linkages of energy and education.

Due to the specificity of this issue, this section draws mostly from linkages between energy and education in South Africa but case studies from elsewhere are also drawn on for comparative analysis.

2.1 ENERGY NEEDS IN SCHOOLS

More than 80% of schools in developing African countries have no electricity (Lithole 1997) For South Africa, figures show that at the time of democratization in 1994, 26 000 schools had no electricity (Bezuidenhout 1998). Studies show that educators are ambiguous as to whether there is a real need for electrification or not. In some case studies schools and educators did not prioritise electricity but put increased number of classrooms, more teachers, repairs to existing buildings and improved transport and access to schools above

electrification in terms of priorities aimed at improving education (Bedford 1998a, Bedford 1998b). However, when given the option of electrification, educators readily list their perceived needs (Meadows 1998).

A number of studies have surveyed energy associated needs and desires among schools. It is not energy alone that can contribute to education, but rather the array of appliances and educational aids associated with modern energy. The following is a list, drawn from the literature (DFID 2002, Bezuidenhout 1998, Cowan 1998, Borchers and Hofmeyr 1997, Gordon 1997, Hallak 1990, UNDP 1989, Thomas and Postlethwaite 1983), of energy needs in schools around the world.

- Lights
- Heating facilities
- Refrigeration, kettles, cookers, water heating facilities
- Audio-visual equipment (TV, VCR, satellite decoders, radios)
- Laboratory equipment
- Computers and printers
- Telephones and faxes
- Skills development equipment (sewing machines, type writers, electric saws)
- Photocopiers
- Security systems

2.2 TYPES OF ENERGY USED IN SCHOOLS

The types of energy currently used in South and East African schools covers the full spectrum of available energy and include grid electricity (from coal fired electricity, biogas, hydro-electric schemes and with some nuclear supply), photovoltaic (solar) systems, diesel generator sets, gas, paraffin, and wood (Borchers and Hofmeyr 1997, Butare 2002). From around the globe, additional energy sources in households, and in all likelihood in schools, in developing countries includes LPG (liquefied petroleum gas), kerosene, candles and dung (UNDP 1997). While no mention is made of their use in schools, a considerable number of households in China use biogas and in Mongolia a number of households use small-scale wind-machines (World Bank 1996). Given the large numbers of households that use these energy forms, it is likely they are also used in schools although the fact that this is not mentioned in the literature is another indication of the lack of priority placed on energy by authors on education.

The volumes of electricity required by schools vary. In their Schools Electrification Programme, South Africa's main energy supplier, Eskom was providing grid connections with a 15 KW h/day supply and photovoltaic systems with a 2.8 KW h/day supply (Borchers and Hofmeyr 1997, Moloto 2003). The voltage of the photovoltaic system is sufficient to cater for lighting for three classrooms, with an average of four lights per classroom, and one office, with an average of two lights (Moloto 2003). In addition socket outlets were installed

and the system could support the additional use of a TV and VCR or overhead projector. Schools running a large number of appliances would need more energy, in particular those schools with heating requirements (One World Design 2000). In post conflict reconstruction situations such as Rwanda, schools use different volumes and different types of energy for different purposes e.g. photovoltaic for water heating, biogas from latrines for cooking (Holland 2002).

2.3 ENERGY USE IN SCHOOLS AND ASSOCIATED COSTS

2.3.1 Modern energy costs for the urban poor and rural communities around the globe

The urban poor in developing countries across the globe spend as much as 15% - 20% of their incomes on energy purchases (World Bank 1995b). Frequently the connection costs to provide modern energy to remote rural areas are excessive and there is a general view that modern energy supply to the urban poor and the rural is expensive and accompanied by poor service delivery. Low load densities, associated with the remote areas also serves to increase costs (World Bank 1996). Low load density connections to grid electricity are in the order of $0.70 per kilowatt-hour in rural areas and $0.10 in urban areas (World Bank 1996). With a high density load this drop to $0.15 and $0.10 per kilowatt-hour respectively (World Bank 1996). This excludes the cost of the initial connection, which is in the thousands of dollars. Other costs at country level might be debt incurred by the provision of modern energy 9INSERT PHD REVIEW INTRO)

2.3.2 A CASE STUDY FROM SOUTH AFRICA

INSTALLATION COSTS

Capital costs for the electrification of schools in South Africa are as follows (Borchers and Hofmeyr 1997, Moloto 2003):

Photovoltaic system (schools > 3km from national grid) R 90 000
Grid connection (schools < 1km from national grid) R110 000
Grid connection (schools 1 – 3km from national grid) R212 600

MAINTENANCE COSTS AND BILLS

The maintenance of the photovoltaic system is estimated to be R 5000 a year (Moloto 2003). No figure could be obtained for the maintenance of grid connections. The maintenance of these systems is the joint responsibility of the Department of Public Works, the Department of Education and Eskom. One of the greatest criticisms of Eskom's Schools Electrification Programme was the lack of planning with regards to responsibility for maintenance costs. Capital funding was provided by foreign donations and generous subsidisation by Eskom, but no provision was made for maintenance and running costs (Cowan 1998, Borchers and Hofmeyr 1997). Cowan (1998) gives a breakdown of the possible running costs associated with the grid and photovoltaic electrification schemes, operating at different levels. No single policy was established for the payment of tariffs for the use of electricity. Payment could be through a number of means including prepayment (Thom *et al.* 1995).

The method of payment would depend on what degree of control the school wished to have over expenditure and whether Eskom was prepared to travel to the school to take meter readings.

Schools were prioritised for the Schools Electrification Programme by a committee comprised of representatives from Eskom, the Department of Education, the Department of Health and Welfare and the Department of Minerals and Energy (Moloto 2003). It was felt that priority should have been given to schools that expressed an interest in electrification and there was evidence of available funds to pay for maintenance costs (Cowan 1998). This would have made for a more sustainable programme.

EQUIPMENT COSTS

For electrification to be effective the appropriate appliances must be purchased. This is an additional cost, frequently not budgeted for by schools or the national and provincial Departments of Education (Thom *et al.* 1995). In their review of the impact of ICTs in schools, Lundall and Howel (2000) raise the issue of the high capital costs of equipment. For ICTs, and many other modern appliances to have any positive impact, there must be other expenditure, for example on teacher training, additional advisory or technical staff, additional classroom space, software, secure storage, and appropriate curriculum development. There are also maintenance costs to be considered in the upkeep of appliances. It is estimated in the commercial sector that the capital cost of a computer is only one fifth of its annual running cost (Lundall and Howel 2000).

The cost of various appliances and technologies can vary dramatically, with some smaller items like lights being more accessible than items like computers. The numbers of students that are impacted by or reached through the medium also affect how the cost is viewed. For example if large numbers of students can learn, in the absence of a teacher, then the technology might be viewed as highly cost-effective (UNDP 1989). Radios are such an example of a cheap and effective technology (UNDP 1989). The issue of cost-effectiveness is difficult and cannot be addressed simply by comparing absolute costs when the impact of the quality of education must always be considered. Some equipment requires special classrooms, such as language laboratories and computer rooms, which means they come with additional costs, inevitably at the expense of some other resource (Hallak 1990).

It is evident that the costs of the effective use of modern energy go well beyond capital costs and for any scheme to be successful and sustainable, all costs need to be considered and factored into the appropriate budget.

2.4 IMPACT OF ENERGY USE ON EDUCATIONAL OUTCOMES

There is no simple link between modern energy *per se*, and educational outcomes. One may consider rather the impact of individual aspects associated with the installation of modern energy in schools, with consideration of how each may influence educational outcomes through the services they provide (DFID 2002). In almost each instance there are arguments that suggest there may be positive benefits to be gained, and other arguments that say there is no direct link between energy and education outcomes. This section reviews how those modern energy needs, identified in section 2.1, **may** benefit educational outputs.

2.4.1 Lights

The provision of electricity can vastly improve lighting where the kilo lumen output of candles and kerosene is only 5% to 10% of that of a 60-watt incandescent bulb and less than 3% of that of a 60-watt fluorescent bulb (World Bank 1995b). Lights are viewed as useful for extended study hours, the use of school facilities after hours for community meetings or adult education, and longer preparation time for teachers (Bezuidenhout 1998). Outside lighting can make access to the school safer after dark (Gordon 1997).

Whether lights are in fact used to these ends is uncertain. Mbewe *et al*. (1992) do cite a positive relationship between the provision of lighting to schools in Ethiopia, and adult education classes. One suggestion is that the only real benefit of electrical lighting is for the use of headmasters, who have shown a tendency to return to their offices in the evenings to work and therefore put in longer hours. It is felt in countries such as South Africa which enjoy long daylight hours, combined with the fact that there is no ethos of after-hours work, means that the benefit of lighting alone on education outcomes would be limited (Anderson 2003).

Despite a drive in South Africa by the RDP (ANC 1994) for an expansion in Adult Basic Education (ABE), using school facilities after hours, there is only limited evidence that lights are being used for night classes for adults (Annecke 1998, Thom *et al.* 1995). The effective use of lights depends on whether classes are being offered at night, if it is safe to attend them, and the development of an ethos of homework and reading at night (Annecke 1998).

On the whole it is considered uncertain that the provision of lighting alone will improve education outcomes (Annecke 1998).

2.4.2 Heating

In some countries such as Mongolia and China, heating in schools is a major issue (MUNEE 2003, One World Design 2000). In those schools which require heating, as much as 50% of the school's budget is spent on heating (One World Design 2000). At a survey done in a number of schools at higher altitudes, heating was described as important in improving learner's health during cold winter months, especially electric heating as opposed to paraffin heaters which are considered unhealthy (Cowan 1998). It is argued though that the provision of heating for the duration of schools hours only, while learners had to return to cold homes, would not improve student health and therefore have little impact on class attendance and subsequently achievement levels. Another report (Lithole 1997) suggests that the lack of heating at school means many children stay at home by the fire during the cold season, and do not attend school, reducing the number of teaching days with negative impacts on school results.

2.4.3 Water heating, refrigeration, kettles and cookers

Cooking facilities and refrigeration are viewed as important, in particular among primary schools, which provide a meal to learners, often an important source of nutrition (Gordon 1997). While in a number of case studies gas, coal, wood or dung was used to prepare food

for school children it was felt that electricity would be an easier option. In some instances there is a social cost to fuel wood collection, where children had to collect wood and suffered a reduction in time available for attending classes (Eberhard and van Horen 1995, Mbewe *et al*. 1992). In south India it is estimated that children contribute a third of the labour required in collecting fuel wood and dung (UNDP 1997). In Leh in the Himalayas, distances to fuel wood mean collection often requires a full two-days journey and a night away from households (DFID 2002). Similar issues are cited as reducing homework time in homes without electricity (Eberhard and van Horen 1995). In this manner patterns of energy consumption among people living in poverty tend to further increase their poverty (UNDP 1997). The provision of modern energy to homes may well ease the domestic burden on learners and thereby could benefit their educational output (Borchers and Hofmeyr 1997). The head of a home economics department at a school in The Gambia complained that the school had been presented with an electrical stove and fridge but these could not be used due to the lack of electricity. Practical sessions had to make use of a charcoal stove, and considerable time was lost in getting the stove going (Lewin and Stuart 1991). In such cases the positive impact of modern energy on education outcomes is self-evident.

2.4.4 AUDIO-VISUAL EQUIPMENT (TVS, VCRS, DECODERS, RADIOS, OVERHEAD PROJECTORS)

Studies in South Africa show overhead projectors are regarded as the most 'standard' item of electrical equipment which teachers expect to have in schools (Cowan 1998). At the start of Eskom's Schools Electrification Programme, a TV and an overhead projector were issued to each school following the installation of a photovoltaic system or with a grid connection. However, on follow up visits it was soon discovered the overhead projectors were frequently not in use due to a lack of materials such as transparencies and overhead pens (Moloto 2003). Following this discovery, schools were no longer issued with overhead projectors, but satellite decoders instead. This raises doubts about the necessity and efficacy of overhead projectors.

In terms of informal and self-education, access to media is cited as powerful (Meadows 1998). One study reports that schools with access to TVs are more successful in terms of results, though whether this is purely attributable to access to TV, or to a number of other factors is debatable (Annecke 1998). An assessment of the value of radio and TV educational programmes in Asia demonstrated them to be effective in imparting basic skills, in improving learning attitudes, in reducing disparities between urban and rural education outputs (with a marked improvement in rural achievements) and in attaining better results with long exposure (Thomas and Postlethwaite 1983).

Other studies suggest that while TVs, VCRs and decoders are frequently seen as attractive, they are not viewed as of great educational benefit by the teaching profession, or that any benefit is definitely hard to prove (Cowan 1998, Hallak 1990).

Many education professionals feel the expense of educational television outweighs its contribution, with no significant impact on improving educational quality (UNDP 1989). Its

impact at the primary school level is described as insignificant. At the post-primary level however, there are some success stories. Mexico has expanded its educational sphere through its Telesecundaria System, which reaches those learners unable to participate in conventional education either due to distance or economics. China has been using educational TV to deliver university education. However, the success of this system is not universally agreed upon, and students qualifying from China's Central Radio and TV University do not receive salaries equivalent to those graduating from conventional universities (UNDP 1989). The success of these TV related schemes seems primarily in extending education to those who did not previously have access to any form of education, but not necessarily in improving outcomes.

The use of radio education is well documented and the results are generally positive. There are reports from South Korea of very successful radio educational programmes. Following concerns about students dropping out of schools for economic reasons, air and correspondence colleges were developed in the 1970s (Thomas and Postlethwaite 1983). Radio programmes were established that broadcast lectures for 313 days of the year and examinations were held in conventional schools during school vacations.

Evaluations suggest that when used well, radio can substantially improve student achievements. A survey of the use of radio in schools in developing countries (Nicaragua, Mexico, Tanzania, Kenya, Sri Lanka, Colombia, Indonesia and the Dominican Republic) suggests that it improves access to schooling through distance learning, it improves the quality of education by providing information and support to teachers, and it is cheap and reaches large audiences (Hallak 1990, UNDP 1989). Success stories include the Nicaragua Radio Mathematics Experiment, Guatemala's Shuar education radio programme aimed at reducing school dropout rates, and the Dominican Republic's RADECO programme, targeted at rural students who could not attend conventional schools (UNDP 1989).

Audio-visual equipment has proven effective in developed countries in improving teaching, in particular in intensive language laboratories and in overcoming learning difficulties with special-needs children (Hallak 1990). In developing countries a frequent stumbling block in the effective use of audio-visual equipment may be a lack of confidence or familiarity among teachers in using these educational aids. Teachers traditionally teach as they were taught, rather than how they were taught to teach and if their own personal experience does not include modern teaching aids these may not be readily used by teachers (Anderson 2003). The inertia or resistance of teachers to new technologies is often found to be central to failures (Hallak 1990). For new curricula to succeed teachers must be re-trained; the same would appear to apply to the introduction of new equipment (Lewin and Stuart 1991).

2.4.5 Laboratory equipment

There are two schools of thought around the necessity of electricity for teaching science. Some argue that to teach the concepts of electricity included in the physics syllabus, in the absence of electricity, is like teaching cooking without food (Clerk 1997). However, Anderson (2003) points out that much has been done to develop micro-experimentation for schools without electricity and that as the high school syllabus does not go beyond the

teaching of direct current, this can be effectively, and indeed more safely, demonstrated with battery power. If curricula are kept relevant, science and basic technology can be related to everyday life by making full use of the tools and utensils available in the community and the resources offered by the surrounding environment (Hallak 1990). Mr Tyhali (2003) of Ukanya School in South Africa said the benefits of energy to the science curriculum were plentiful, and said even simple things like being able to show students in remote areas the differences between steam, water and ice, goes a long way in improving a student's understanding. Likewise in Uganda (2000) Mr? Of? School said modern energy was important for classes but perhaps more important to improve teachers lives.

There can be no doubt that in terms of teaching the broader subject of technology, a priority area of expansion in many developing countries (as outlined in South Africa's Curriculum 2005, South African Government 2002) is that electricity, and a number of electrical appliances, would be undeniably beneficial (Anderson 2003). Studies suggested that at present such facilities are only available in a limited number of schools and that this is due both to the expense of the appliances and the lack of modern energy (Anderson 2003, Lewin and Stuart 1991). It is also noted that schools may be reluctant to obtain equipment when the likelihood of theft is high or where more than one school uses school buildings and there is inappropriate responsibility for property (Beeby 1979). At a more advanced level, certainly in tertiary education and possibly in secondary education, infrastructures and advanced equipment are necessary. This is particularly true where schools must keep up with contemporary approaches to science and technology teaching (Hallak 1990). One technical subject teacher is quoted aptly as saying, 'Tools, materials and machines are not just teaching aids in our area; we need to have them in the first place' (Lewin and Stuart 1991).

It is felt though on the whole that the provision of basic equipment for laboratories is a pressing priority and often one of great expense. In light of the cost of importing equipment some countries, such as Nigeria, have set up effective school science equipment manufacturing programmes, dramatically reducing the cost of science equipment with relief on the education budget (Hallak 1997).

While basic science and physics can be effectively taught in the absence of modern energy there is a view that the teaching of these subjects, and most certainly the technical subjects, can be greatly enhanced through the use of electricity.

2.4.6 Computers, printers and ICTs

Computers and printers are used widely for word processing by school secretaries with access to these facilities. The use of email is also recognized as an administrative aid that could reduce the amount of time spent by teachers obtaining information (Anderson 2003). ICTs provide access to a broad knowledge base and allow for the development of skills increasingly viewed as essential to the working world (Lundall and Howel 2000, World Bank 1995a).

While the basic curriculum can be delivered in the absence of computers and ICTs, there are a number of strong arguments in favour of embracing the use of ICTs in education with a

view to improving development and poverty alleviation objectives (see 4.1) and to achieve this electricity and telecommunications connections to schools are essential. Computers are described as effective learning tools to aid in drill practice, tutorials, the portrayal of simulations, reducing pupil to teacher ratios, creating individualized learning environments, data manipulation, and in learning programming language (Hawkridge 1990). The value of computers in schools is increasingly recognized. Studies in the United States have demonstrated positive impacts between computer based learning and educational outcomes (UNDP 1989). Several developing countries have made a serious push towards the adoption of computers in their schools. In 1983 China provided an initial 300 million Yuan in support of its newly adopted policy on installing computers in certain schools (Hawkridge *et al.* 1990). The provision of modern energy and the associated potential for ICTs is cited as a possible step to addressing general access issues, where ICTs may expose learners (and society) to different attitudes to education access and its positive impacts (DFID 2002).

2.4.7 Telephones and faxes

The loss of teaching time is described as a central cause of poor educational performance (Zille 1999, Hallak 1990). In schools without access to telecommunication facilities, teachers travelling to administrative centres to obtain information spend considerable time away from their classes. This is time consuming and frustrating as there is no prior knowledge if the appropriate person will be in the office at the time (Cowan 1998). Telecommunication facilities can increase teaching time, and increased teaching time is cited as improving educational outcomes. Increasingly, since 2000 this situation has improved due to increased mobile networks across Africa.

2.4.8 Skills development equipment

Skills development is viewed as an important tool in aiding development. A development of a number of skills would be enhanced by access to electricity such as woodwork, typing, sewing and home economics. A few schools have by-passed this need by using gas or charcoal powered stoves and diesel generator sets (Cowan 1998, Lewin and Stuart 1991). Given the appropriate circumstances the provision of electricity would expand the potential for the development of these areas of education, which would in turn have positive benefits on outcomes and potential employment.

2.4.9 Photocopiers

Photocopiers are viewed as of high importance in easing the administrative burden in schools, and there is considerable evidence that where available, photocopiers are used extensively (Anderson 2003, Cowan 2002). In particular photocopiers are useful in reproducing final exam papers. Where photocopiers can be made available to surrounding communities (who pay to use them) the community sees them as an important asset. The lack of budget for paper and maintenance does hinder the use of photocopiers to their full potential (Anderson 2003). This, combined with a lack of experience, could limit the use of photocopiers in generating material for learners. While photocopiers may make a school run more efficiently and could potentially increase teaching and preparation time, there is no recorded link between this appliance and educational outcomes.

2.4.10 Security systems

Theft is viewed as a major problem in schools. In South Africa the director of the Western Cape branch of the Independent Schools Association in South Africa, Peter Anderson, says none of the schools he deals with in the Western Cape have not lost electrical equipment, in particular computers, through theft in the last four years (Anderson 2003). In follow up studies of schools that received electricity with South Africa's Eskom lead Schools Electrification Programme, there were reports of stolen batteries from photovoltaic systems and vandalized lights (Bedford 1998a, Bedford 1998b). Studies around the world show that frequently equipment given to schools has to be kept off the premises due to security problems and is therefore redundant (Hallak 1990).

The provision of electricity could allow for the installation of burglar alarms, sirens and outside lights for improved security at night. These measures may make any electrification scheme more sustainable and therefore more beneficial to overall educational outcomes although this is a tenuous link.

2.5 EDUCATION, ENERGY AND ECONOMIC GROWTH

Basic education is described as the foundation for all personal, social and economic development, enabling individuals to lead responsible, fulfilling and productive lives (Cole and Flanagan 1995). There is little doubt of the linkages between education, and economic growth and development (Todaro 1997, UNDP 1997, World Bank 1995, Thirwall 1990). Education is described as having a high economic rate of return, where the costs and benefits of the investments, expressed as an annual percentage yield, demonstrate that investment in education has a high, positive economic return (World Bank 1995). This rate of return is highest in low to middle income countries, with the greatest potential yields evident for Sub-Saharan Africa (World Bank 1995a). An exploration of correlations between rate of real per capita income growth, share of investment in gross domestic product and educational attainment in 113 countries, demonstrated primary education to be the largest single contributor to economic growth (World Bank 1995a).

Similarly, there is evidence of the linkages between modern energy and development (DFID 2002, Bagnaut 1994). Energy, in addition to more conventional inputs such as capital, land and labour has been recognized as an essential resource for economic development (Bagnaut 1994). No country in modern times has substantially reduced poverty without massive increases in consumption of modern energy (DFID 2002). Analyses have confirmed that there is a direct correlation between a country's industrial progress, and subsequent economic growth, and its per capita energy consumption (Bagnaut 1994). Davidson (1994) states that the continuing poor economic growth of sub-Saharan Africa is reflected in its low consumption of modern fuels. It is also suggested that the effective use of modern energy has the additional development bonus of attracting foreign investment in developing countries (DFID 2002).

Linkages between education, energy, and economic growth are more tenuous and generally based on conjecture or on indirect linkages. The areas where there may be a direct linkage

between education, energy and development are those of ICTs, and science and technology education. It is suggested that information and knowledge are more valuable than natural resources and that the provision of ICTs in the education system, with the prerequisite provision of electrification, would make a dramatic contribution to the economic growth of a country (Lundall and Howel 2000). Similarly technological skills development is recognised as a significant contributor to development.

2.6 EDUCATION ABOUT MODERN ENERGY

Education about energy has various aspects. The first is in developing an understanding of modern energy, the basic principles of how it works and giving learners an understanding of its potential and addressing safety and use issues. The second is in exposing the world of modern energy, as an industry, to learners as an area in which they could potentially work. Finally there is a need to raise awareness of the myriad of global issues associated with energy.

In South Africa, Eskom has a schools education programme whereby they visit primary schools and deliver presentations on the history of electricity, demonstrate how it is generated and cover a number of safety issues (Henn 2003). Schools are targeted on the basis of "hotspot" areas; primarily those areas where electricity presents safety problems, such as newly connected squatter camps. Such presentations may make learners aware of the potential of electricity, which could in turn have positive development spin-offs in expanding people's horizons to the types of opportunities provided by modern energy.

A detailed understanding of the workings of modern energy and understanding of the potential to pursue a career in associated areas of science and technology could serve to give learners aspirations to pursue these fields, which have been identified as important for development. The recurrent cost of importing expertise, in particular in the areas of science and technology, into developing countries, could be vastly reduced should these skills be available among the workforce in the country (Karekezi and Ranja 1997). The need for properly trained engineers, technologists and technicians, knowledgeable in various aspects of energy for development and better utilization of energy is well recognized (Bagnaut 1994). This is reflected in the fact that the improvement of science and technology training is an educational priority in most developing countries (see section 1.1.b). In addition to the larger industry of energy provision, electricity allows for the potential establishment of small businesses opportunities such as shops, welding centers and wiring contractors (Lithole 1997, Mbewe *et al*. 1992).

The world is currently going through an unprecedented rate of scientific and technological advancement and it might be argued that never before was there a greater need for a scientifically literate society. This is also an age of uncertain energy supplies, overpopulation, economic problems and social disruptions and students should be equipped with an adequate knowledge base and an awareness of the linkages between energy and this

myriad of global issues if they are to effectively address them, as tomorrow's leaders (Kirwan 1987).

Education about modern energy is a multifaceted learning area, one that is increasingly important in the light of technological advancement and should not be overlooked in curriculum development.

3 Assessment of linkages

3.1 DO THEY REALLY EXIST AND WHAT IS THE EVIDENCE?

The literature indicates out that the provision of modern energy alone is insufficient to have any impact on educational outcomes, but rather that impacts depend on the *effective* use of appliances and teaching aids (Borchers and Hofmeyr 1997). In addition to this, where schools operate with few basic facilities, too few classrooms and low teacher to pupil ratios, the impact of modern energy on teaching and learning is likely to be minimal. It is suggested that for the provision of modern energy to have a positive impact these other, more fundamental constraints would have to first be addressed (Borchers and Hofmeyr 1997). In light of varying constraints, the cost-effectiveness and impact of various technologies associated with modern energy, are also likely to vary (UNDP 1989).

Aside from these qualifiers, views in the literature range from uncertainty regarding direct linkages, to more convinced views. The World Bank report (1995b) states that the positive relationship between educational opportunities, made possible by electric lighting, and higher lifetime earnings, is well documented[2]. Taubman and Wales (1974), quoted in this report, expand on their view of increased earnings with improved education as related to the provision of modern energy. A study in Bonga, Ethiopia, states school exam results increased from an average of 10% to 80% between 1989 and 1990 following the electrification of schools. These results are compared with those of schools in neighbouring Tepi, which remains unelectrified, and went from 5% to 17% during the same time (Mbewe *et al*.1992). Lithole (1997) also cites improved education results as a function of electrification, as evident when compared with unelectrified areas. Butare (2002) stresses that most of the work conducted at the Kigali Institute for Science and Technology in Rwanda could not be facilitated without appropriate energy provision. The UNDP (1989) also state that studies show that education technology, associated with modern energy, can contribute to sizeable improvements in student achievement if used over a period of time. Their report attributes learning gains to improved quality of content and the delivery power of technology associated with modern energy (UNDP 1989). What may be possible is the suggestion that

[2] This report cites Barnes 1985, Fitzgerald, Barnes and McGranahan 1990, Paliwal 1985 and Taubman and Wales 1974. The author failed to obtain the first three of these references in order to contextualize and validate the statement. This is only noted, as there are few references that draw direct linkages between education and modern energy.

technological teaching aids are generally introduced in conjunction with improved instruction methods (UNDP 1989).

In prioritising the supply of electricity to all schools, the South African government reported that the benefits of electrification to the nation as a whole are likely to be high (Bezuidenhout 1998). Barnes (as cited Davis 1995, World Bank 1995b) concludes that while causality cannot be determined, the results suggest that electrification and educational programmes are complementary and that electricity can, at the least, facilitate the effective implementation of literacy projects (Davis 1995). Gordon (1997) quotes informants in the education sector as stating that electrification has a positive impact with learners from electrified schools doing better than those from schools without electricity. Positive outcomes are attributed to better participation in and demonstration of scientific experiments, and the added value of teaching aids to the teaching process. These informants acknowledge that benefits cannot be quantified and go on to state that the primary cause to positive education outcomes will always be good teaching. This is reiterated throughout the literature.

It is evident that in specific sectors there are direct links, even if these have not yet been measured empirically. Bezuidenhout (1998) sums up the issue of energy and educational linkages with a cautionary note, saying, given sufficient, well-trained teachers and adequate facilities (laboratories, water, and workshops), modern energy may indeed prove useful in extending the learning experience (Bezuidenhout 1998).

3.2 ARE THEY DIRECT / INDIRECT, TENUOUS, OR ARE THESE ‘LINKAGES’ JUST ASSUMPTIONS?

Linkages reported in the literature, and cited in this review, are qualitative, frequently indirect and occasionally tenuous. Moreover they are largely dependent on people’s views, which vary according to their perspective, which usually divides into two camps – the educationalists viewpoint or that of the energy specialists (Poston 2003).

3.3 IS THERE QUALITATIVE OR QUANTITATIVE EVIDENCE TO SUPPORT THE LINKAGES?

What little evidence is available to support linkages between energy, education and poverty alleviation is predominantly qualitative. In the one instance where figures are stated (Mbewe 1992), we do not have sufficient information to be certain of the causality, rendering these quantitative measures invalid. Both Bezuidenhout (1998) and Cowan (1997) state that the benefits of electrification on education cannot be quantified. Similarly both go on to speculate that while there is no evidence to the contrary, there must be some positive benefits. The common view is that when one examines the evidence of the potential benefits, logic leads one to assume that there must be positive outcomes. However, no study even suggests what variable might be measured in an attempt to quantify linkages between energy and educational outcomes. Suggestions of what might be measured are given in section 5.

3.4 THE 'DANGERS' OF RAPID ELECTRIFICATION ON EDUCATION – LEAPFROGGING DEVELOPMENT AND THE CREATION OF INEQUITY

There is concern that rapid electrification, without the necessary support structures to ensure the development is effective and sustainable, will in fact result in no benefit or even be counter productive (Annecke 1998, Cowan 1998).

Some rural communities who have received electricity in sub-Saharan Africa were found to be continuing using biomass fuel, as it was better understood, cheaper and required no appliances (Lithole 1997). On average it took newly electrified villages five years to fully take advantage and make use of the modern energy source (Lithole 1997), suggesting development may have outstripped demand or desire. Another example of 'leapfrogging' is where schools presented with expensive electronic equipment are so afraid it will be stolen, and as they do not have adequate school security, it is locked away off the property, and thus becomes redundant (Hallak 1990).

The accelerated electrification of some schools by Eskom in their Schools Electrification Programme without prior consideration of maintenance and operation costs could be seen as one such instance where development has been too rapid and therefore inappropriate. A review of the Schools Electrification Scheme by a group of Belgium students was described by Mr Moloto of Eskom as "damning". They said the scheme had leapt in with little consideration of the sustainability of the project (Moloto 2003). Eskom feels in many instances the electrification of schools through the scheme has been extremely successful with effective ongoing use (Moloto 2003). The number of concerns rose in relation to lack of training, insufficient relationships between the South African Department of Education and major service providers, inadequate appliances and uncertain running costs do suggest there is a danger in this case in 'leapfrogging' development (Cowan 1998, Borchers and Hofmeyr 1997, Lundall and Howel 2000).

Schools electrification projects were described as most successful where there had been extensive consultation with communities prior to installation and in particular where community structures already existed (Bezuidenhout 1998). A top down approach, with the installation of electricity in schools without community participation made for less effective use of the scheme. There is a need to guard against massive initial investments without proper long-term plans to ensure sustainability (Meadows 1998).

4 Equity in access to modern education tools, in particular ICTs and teacher retention in rural areas

4.1 EQUITY IN ACCESS TO MODERN EDUCATION TOOLS PARTICULARLY ICT

There are two global views on the inclusion of ICTs in schools. The first is that ICTs should be embraced fully or learners, and in turn countries, will suffer exclusion from modern society. The second is that ICTs are not the panacea for social and economic development they are frequently made out to be, and that they should be approached with caution. They have the potential to overshadow more pressing needs, and may exacerbate existing access and equity issues (Lundall and Howel 2000).

-

4.1.1 Argument for embracing ICTs

The convergence of telecommunications, microelectronics and computers have lead to the emergence of ICTs as the primary means through which information and knowledge are transmitted and ICTs are now intrinsic components of knowledge societies (Lundall and Howel 2000). ICTs are cited as the most effective means through which up to date information can be delivered to learners across time and space. Hawkridge *et al*. (1990) argue for the inclusion of ICTs in schools on the grounds that: they will demystify what are potentially an intimidating technology; provide vocational training and therefore aid national development; allow for effective learning of specific subjects through their use as a teaching aid; and that they serve as a catalyst, improving the overall function of a school by aiding in teaching, administrative and managerial efficiency. Failure to participate may serve as a limitation to development and may hinder future attempts to join the global information infrastructure. While the costs of installation and operation are high, it is perceived that the long-term costs of non-participation would be higher (Lundall and Howel 2000, Hallak 1990). Whether countries lack resources, at least by establishing a policy on ICTs, they are open to donations and external funding that might be offered in support of achieving their priorities (Hawkridge *et al.* 1990). Another successful approach in dealing with prohibitive expenses in supplying schools with ICT infrastructure is that some countries have set up citywide computer centers at which students from all schools receive instruction (Hallak 1990).

Tindimubana (1994) states that Africa cannot afford to ignore the information and technology revolution, ‘having entered the colonial era with a hoe and exited with a hoe,

there is considerable lost ground to be recovered in educating Africans to partake in the global arena'. He goes on to suggest that emerging technologies be assessed for their threats and opportunities for the development of the continent, and embraced accordingly. Access to ICTs in Africa has grown dramatically since 1994 when only South Africa and Egypt had full Internet connectivity, to the current situation where all countries have at least some form of Internet access (ADEA 1999)

Just as the world is divided along lines of developed and developing countries, participation in or failure to embrace ICTs in education may further pronounce this divide, serving to increase existing gaps. Currently the global division between those countries with ICT access and without is marked. This is demonstrated in the stark contrast between the United States of America, where in 1998 an estimated 31 million people had internet access in their homes, and Africa where in 1998 it was estimated that less than 1% of the continent's population had access to the internet (ADF 1999 as cited in Lundall and Howel 2000). Nonetheless, ICT uptake was rising most rapidly in Africa during 2002.

4.1.2 Cautionary arguments relating to access and equity

A statement by UNESCO (UNDP 1989) in 1987 expresses concern of the impacts of the development of what they term 'informatics in education'.

> *'UNESCO holds with the principle that informatics for educational purposes should be considered from the point of view of the democratization of education and quality of opportunity for all. An unequal development of informatics would widen the gap between developed and developing countries. The risk of disparity exists not only as between countries, however, but also within each country if the development of informatics means advantaging a minority of the population at the expense of its majority.'*

There is always the danger of throwing technology at the development 'gap' in an attempt to bridge it. We need to beware of the over simplified notion that simply through equal access we can "level the playing fields". Access to technology is not an end in itself and equity goes beyond simple machine counts. New technologies are never distributed evenly across society (Dalin and Rust 1996). For any ICT development to serve an effective role in dealing with access and equity issues, it needs to develop the ability to effectively access and use appropriate information. Any ICT development should be carried out with an appropriate policy framework and with due consideration of learners' needs and priorities (Lundall and Howel 2000). The high capital investment in ICTs means there must be every assurance that an ICT project is sustainable. Haddad (1999 cited in Lundall an Howel 2000) sounds a cautionary note, stating that "technology is only a tool" and that without effective training of teachers and support staff there is the danger that ICTs may be a dysfunctional investment. Danger of the seductiveness of computers and associated technology that there may be a tendency to squeeze it into all aspects of the curriculum at the expense of the learning experience. The place and role of computers must be determined in context with other available facilities, abilities and technologies (Hallak 1990). The introduction of ICTs require a co-ordinated and systematic approach and spontaneous development and a *laissez faire*

approach have often led to impaired functioning and wastage (Hallak 1990). For many the question is not whether or not to adopt ICTs, but how to introduce them in a smooth and effective manner that ensures true value for money (Hawkridge *et al.*1990).

Dalin and Rust (1996) describe the knowledge and information society as one that accentuates social class, increasing the distance between those who have access to knowledge and those who do not. Some developing countries recognize the need for a certain amount of ICT expertise, but are constrained by limited budgets, so channel ICT education to only a few. If no clear strategy exists, this education is likely to go to the already privileged in society (UNDP 1989).

Some feel that ICTs improve equity issues as those removed from learning centers can now participate (Dalin and Rust 1996). For example in New Mexico remote high schools are connected to community colleges via two-way video hook-ups, through which they engage in interactive instruction (Dalin and Rust 1996). Computer innovations include networks for teachers to interact and help one another teach more creatively with regards to computer technology (Dalin and Rust 1996).

Equitable access and use of ICTs are issues that do not only relate to the developed and developing countries divide but may also serve to increase gender inequities. Firstly, where men make policy decisions relating to education and secondly, in those countries where fewer girls attend school than boys (Lundall and Howel 2000). An example where the provision of modern energy exacerbates an access and equity issue where electric lights allow learners to use school buildings after hours, but it has been found in South Africa that this is generally limited to boys, as girls do not always feel safe coming to school after sunset (Gordon 1997).

4.1.3 ICTs in South Africa

In South Africa the National Centre for Educational Technology and Distance Education in the National Department of Education identified the need for the development of clear and comprehensive polices for the development of appropriate and sustainable ICTs in South African schools (Lundall and Howel 2000). There is obviously a desire to incorporate ICTs into South African education, but all parties are conscious of the very real financial and infrastructural limitations. ICTs are by no means the norm in South African education. The Schools Register of Needs Survey in 1996 found only 8.8% of South African schools had access to one or more computer (Lundall and Howel 2000). While the National Norms and Standards provides a framework for state expenditure aimed at redressing inequalities in schools, budgets are rapidly used up by major infrastructural requirements and it is recognised that funding for ICT development in schools must come from outside (Lundall and Howel 2000). For schools to even contemplate the use of ICTs they need a steady power supply, telephone line and sufficient classroom space. There are considerable challenges to the desire to bring South African education into the information age.

4.2 ENERGY AND MANAGEMENT OF EDUCATION RESOURCES

The availability of modern energy in developing countries varies considerably. In 1993 in sub-Saharan Africa the percentage of the total population with access to electricity ranged from a mere 4% in Malawi and 6% in Zaire to 18% in Zambia and 51% in South Africa (Lithole 1997). The degree of available energy may influence the use and prioritization of modern energy in education. Once national educational strategies and priorities have been established, decision-makers must identify the requirements for successfully meeting and implementing those goals, and the available resources the country has to do this (UNDP 1989).

South Africa's historical legacy means that there is a substantial backlog in terms of minimal education requirements. The Schools Register of Needs found, in 1996, that only 17% of South African schools had libraries and only 50% had adequate textbooks. Between the years 1995 and 1998 there was a reduction in government spending on textbooks from R851 million in 1995, to R381 million in 1996/7 to R226 million in 1998 (Lundall and Howel 2000)[3]. South African educators question school electrification as a priority, and Thom *et al.* (1995) cites one as saying "electrification is probably one of the least critical inputs to improve the quality of education in South Africa." While recognized as beneficial, until basic infrastructural issues are addressed, any likely benefit of electrification will be constrained (Cowan 1998).

4.3 TEACHER RETENTION IN RURAL AREAS AND MODERN ENERGY

4.3.1 Global rural-urban migration trends

Globally urban population growth rate is outstripping rural by a ration of 3:1 due to massive rural-urban migration (Brown et al. 2000). Population increase in urban centers of developing countries is expected to account for 90% of the additional 2.7 billion people to be added to the planet by 2030 (Brown et al. 2000). It is estimated that urbanization in sub-Saharan Africa will increase from 26% in 1990s, to 32% by 2000 and 42% by 2020 (Lithole 1997). Specific figures vary considerably between countries, with Rwanda's urban population accounting for only 6% of the population in1993 in contrast to the Seychelles of 53% (Lithole 1997). Rapid urbanization has large social and environmental costs and a number of governments have rural development programmes, which aim to reduce rural-urban migration.

The supply of electricity to rural areas is frequently a central component of such schemes, where electricity is perceived as a vehicle for economic development and lifestyle improvement (Lithole 1997). Frequently the move to electrify rural areas is a political move and often proves financially unviable where the remote nature of rural areas means the cost of electrification is twice that of urban areas (Lithole 1997). The notion that the supply of

[3] It must be noted that while exact figures could not be obtained, this budget allocation has risen again, though perhaps not to the levels of 1995.

electricity to rural areas and associated access to lights, TV, and modern amenities, will stem the tide of rural-urban migration is debatable and evidence is conflicting (Kim and Smith 1989). In Kenya as many as 20 000 rural households have purchased photovoltaic systems for electric lighting, despite high import taxes on this equipment. By contrast the government's rural electrification scheme has been sluggish and only reached 17 000 households. This illustrates the value people in remote locations place on electric lighting (ESMAP 1994). On the other hand countries with the most complete rural electrification schemes have the highest rural-urban migration rates. It is thus suggested that exposure to modern technology, combined with increased agricultural productivity associated with the provision of modern energy in rural areas contribute to migration to urban areas (Kim and Smith 1989). Despite these migration figures, there can be little doubt that the provision of modern energy does improve standards of living in rural areas, as has been demonstrated by a number of health, productivity and social indicators across the globe (Kim and Smith 1989).

4.3.2 The problems of teacher retention in rural areas

Generally most countries have problems in ensuring that good teachers go to rural areas (Postlethwaite and Thomas 1980). Rural teachers often have to travel long distances to school, and their isolation and lack of advice or professional support add to their frustrations. In rural areas, housing and other facilities for teachers are often rudimentary and make it difficult to recruit and retain staff in rural schools (Graham-Brown 1991). In Burkina Faso, poor teaching conditions are cited as the reason there is such resistance among teachers to rural postings (ADEA 2001). In Thailand the problem is worst among science and maths teachers, where there is generally an over supply in urban areas and a deficit in rural areas (Postlethwaite and Thomas 1980). Suggested incentives to attract teachers to rural areas include salary incentives, housing and scholarships for teacher training. Brazil reports a definite problem in retaining quality teachers in rural areas where most rural teachers in Brazil are lay teachers with an average of only four years of schooling. These teachers are generally paid low salaries and often are the only teacher allocated to a school (Puttaswamaiah 1994). A study in Sudan found that formal education was not valued in rural areas, which seemed to stem in part from feelings of social discontent and alienation, and did little to encourage teachers to move to rural areas (Graham-Brown 1991). Numerous studies of migration in diverse countries have documented the positive relationship between educational attainment of an individual and his or her propensity to migrate from rural to urban areas (Todaro 1997). This may be true of teachers who are generally well-educated professionals.

In South Africa a number of social policies have been developed concerned with the security, sustainability and 'decency' of rural people's lives. These policies serve to increase and enrich rural livelihoods and are largely concerned with securing basic assistance, services and infrastructure, and in general lay the basis for a rising standard of living for rural people. While it is recognised in general that South African teachers receive insufficient support services and frequently work in poor conditions (ANC 1994), no documented evidence was found in this review of an out migration of teachers from rural areas. It is suggested that the current climate of job uncertainties among teachers is such that teachers would not risk

leaving secure posts in rural areas in search of posts in urban areas (Anderson 2003). World Bank (1995b) calls for well-managed programmes that are affordable, financially viable, and that can be justified on economic grounds can significantly improve the quality of life and productivity of rural people.

4.3.3 Modern energy's role in attracting and retaining teachers

In general rural electrification provides a large number of benefits and is often pursued by governments with the intention of reducing rural-urban migration. There is however, little evidence that this is indeed the case (Davis 1995). Employment opportunities elsewhere are cited as the most over-riding consideration affecting a decision to move and since rural electrification has not been found to generate substantial numbers of jobs its effect on this decision is seen as minimal (Davis 1995). Moreover, exposure to urban culture through media with access to modern energy, may serve to encourage urban-rural migration (Cecelski 1992 as cited in Davis 1995).

An improved educational experience and better outcomes that are suggested to be associated, though tenuously, with electricity may provide a more satisfactory professional experience for teachers and indeed electrified schools may be more attractive to teachers. It is suggested that the provision of electricity to teacher's homes would increase preparation time with longer periods with satisfactory lights and an eased domestic load (Gordon 1997). Whether the ethos exists for this to take place is uncertain. No evidence was found directly linking the provision of modern energy and teacher retention.

5 Recommendations

The provision of modern energy to schools is a fundamental requirement to meet key development objectives in education and it supports the principles of democratisation, access, equity and redress (Gordon 1997). The symbolic value of electrifying schools is considerable and given limitless funding it is a right that should be extended to all (Bezuidenhout 1998). There is consensus that there are benefits to be obtained through the electrification of schools. Concern is expressed that failure to participate in the expanding world of ICTs will condemn developing countries to the margins of the developing world (Gordon 1997). However, similarly, there is consensus that there are a number of pressing issues that must be addressed in education and that electrification is not necessarily the most urgent. Frequently infrastructural or social issues must be met as prerequisites for any electrification scheme to add any value. While electrification can be seen to promote a number of global education priorities, there are other development, and education priorities, such as the AIDS pandemic, which are viewed as more pressing.

Experience outlined in the literature suggests the following must be addressed prior to effective electrification of schools:

- To ensure the efficacy of the electrification of schools, basic infrastructural needs must first be met.

- Good coordination and communication between the energy suppliers and end users to ensure genuine needs are met, and that systems are sustainable.
- Electrification of schools needs to be part of a well-formulated national development framework and must not advance in a vacuum.
- Funding for the maintenance and running of electricity in schools must be secured prior to installation.

There is an opportunity for technological leapfrogging, whereby developing regions can consider energy sources that are modern and better than those used in industrialized nations that have contributed to so many of the earth's environmental problems (UNDP 1997). Energy education is an important means of exposing learners to the potential both provided by modern energy in terms of pursuing careers dependent on it, and in exposing them to a huge and important industry, with, given the right skills, they can contribute to. Energy education is also important in ensuring the safe use of electricity and other energy sources.

Given the time since the implementation of Eskom's Schools Electrification Programme in South Africa, it would be a useful and well-timed case study to attempt to gain some quantitative data on the impacts of electrification and education outcomes. This could be achieved through surveying those schools that have been recently connected to the national grid or received a photovoltaic system. Correlations could be sought between electrification and teacher turnover, results, literacy, school attendance, and the use of the school for after-hours learning or use by the community. These could be contrasted to schools without electricity or with figures prior to electrification in recently connected schools. Similar case studies could be sought in other countries to allow for between country comparisons. However, some measures may only be relevant within countries, results or pass rates for example are of limited value globally where different countries have different criteria for promotion from grade to grade (Graham-Brown 1991). It is suggested that researchers be cautious of using simple input measures in exploring the value of modern energy in education, such as per capita expenditure, but rather use output indicators, relating to what the child has in fact learnt (Hallak 1990). Surveys could also be used to gain a clear view of teacher's priorities and needs to ensure any future project targets the genuine needs and desires of those on the ground.

The 1990s saw the introduction and use of educational technologies such as radio and TV as a priority and now would be a good time to attempt to assess the success of some of the programmes, such as the DFID funded ITC programme in Rwanda and projects arising from South Africa's Schools Electrification Programme, devised and implemented during the last ten years (UNDP 1989).

REFERENCES AND PERSONAL COMMUNICATIONS/CONTACTS LIST

ACTIONAID. 2003. Our Priorities. www.actionaid.org/ourpriorities.

African Development Bank (ADB). 1003. Gender, poverty and environmental indicators of African countries. African Development Bank Report.

African National Congress (ANC). 1994. Reconstruction and Development Programme. African National Congress.

African National Congress (ANC). 1996. Children, poverty and disparity reduction. Towards fulfilling the rights of South Africa's children. African National Congress.

Anderson, P. 2003. Director, Western Cape Branch Independent Schools Association. Personal communication.

Annecke, W. J. 1998. The benefits of electrification to rural households: real or potential. Journal of Energy in South Africa 9 (4): 120 – 124.

Association for the Development of Education in Africa (ADEA). 2001. ADEA Quarterly Newsletter, ADEA.

Association for the Development of Education in Africa (ADEA). 1999. ADEA Quarterly Newsletter, ADEA.

Bagnaut J. 1994. Human resources development and training in the African energy sector. In Science in Africa: American Association for the Advancement of Science's sub-Saharan Africa Program Symposium Proceedings, California.

Bedford, L. J. 1998a. Electrification of schools in non-grid areas in Region E, Eastern Cape. Energy and Development Research Centre, Cape Town.

Bedford, L. J. 1998b. Electrification of schools in non-grid areas in Region E, Eastern Cape: Post electrification study in AmaNtshangase and AmaNdengane. Energy and Development Research Centre, Cape Town.

Beeby, C. E. 1979. Assessment of Indonesian education – a guide in planning. Oxford University Press, Wellington.

Bezuidenhout, S. Photovoltaic electrification of two schools in the rural areas of the Northern Province, South Africa: A case study. Journal of Energy in South Africa 9 (4): 115 – 119.

Borchers, M. and Hofmeyr, I. 1997. Rural electrification supply options to support health, education and SMME development. Energy and Development Research Centre, Cape Town.

Brown, L. R., Renner, M. and Halweil, B. 2000. Vital signs 2000: environmental trends that are shaping our future. World watch institute, W.W. Norton and Company, New York.

Buchert, L. 1997. Education in the development of Tanzania: 1919 – 1990. Villiers Publications, London.

Butare 2002 Kigali Institute of Science and Technology, Kigali, Rwanda, Personal communication

Child Labour Bulletin. 1996. Statistics on child workers in China. www.citinv.it/associations/CNMS.

Chikka, C. 2003. Kenyan High Commission. Personal communication.

Clerk, D. 1997. Energy requirements to teach secondary school science. Appendix A to facilitating education in rural areas of South Africa: the role of electricity and other energy sources. Energy and Development Research Centre, Cape Town.

Cole, M. and Flanagan, W. 1995. Quality primary education in South Africa: a policy perspective. Development Bank of South Africa, Johannesburg.

Cowan, B. 1998. Improved energy for rural schools: guidelines to assist in planning choices. A report for the Independent Development Trust. Energy and Development Research Centre, Cape Town.

Dalin, P. and Rust, V. 1996. Towards schooling for the twenty-first century. Cassell, London.

Davidson, O. R. 1994. Energy and power development in sub-Saharan Africa: challenges and prospects for the future. In Science in Africa: American Association for the Advancement of Science's sub-Saharan Africa Program Symposium Proceedings, California.

Davis, M. 1995. Institutional frameworks for electricity supply to rural communities: a literature review. Energy and Development Research Centre, Cape Town.

Department For International Development (DFID). 2002. Energy for the poor: underpinning the millennium development goals. DFID, London.

Eberhard, A. and van Horen, C. 1995. Poverty and Power: energy and the South African state. UCT Press and Pluto Press, London.

Energy Sector Management Assistance Programme (ESMAP). 1994. Photovoltaic power to the people: the Kenya case. Report No. 143/91. World Bank/UNDP Energy Sector Management Assistance Programme (ESMPA) Series. World Bank, Washington DC.

Eisemon, T. O. 1988. Benefiting from basic education, school quality and functional literacy in Kenya. Pergamon Press, Oxford.

Graham-Brown, S. 1991. Education in the developing world: conflict and crisis. Longman, London.

Gordon, A. 1997. Facilitating education in rural areas of South Africa: the role of electrification and other energy sources. Energy and Development Research Centre, Cape Town.

Hallak, J. 1990. Investing in the future: setting educational priorities in the developing world. Pergamon Press, Oxford.

Hawkridge, D., Jaworski, J. and McMahon, H. 1990. Computers in third-world schools: examples, experience and issues. MacMillan Press, London.

Henn, J. 2003. Eskom education officer. Personal communication.

Holland, R. 2002 ITDG Personal communication.

Karekezi, S. and Ranja, T. 1997. Renewable energy technologies in Africa. Zed Books Ltd., London.

Kim, Y. H. and Smith, K. R. 1989. Electric power in development. The experience of north East Asia. Greenwood Press, New York.

Kirwan, D. F. 1987. Energy resources in science education. Pergamon Press, Oxford.

Lewin, K. M. and Stuart, J. S. 1991. Educational innovation in developing countries: case studies of change makers. MacMillan

Lithole, T. C. 1997. Rural electrification and development in developing countries: south and eastern sub-Saharan Africa. MSc thesis, University of Cape Town.

Lundall, P. and Howel, C. 2000. Computers in schools: a national survey of information communication technology in South African schools. Education Policy Unit, University of the Western Cape.

Maltha, H. W., Gerrissen, J. F. and Veen, W. 1999. ICT and third world higher education: the means and the ends. Thela Thesis, Amsterdam.

Mbewe, A., Mariam, H. G., Ramasedi, B., Khalema, L. and Ahmed, I. A. 1992. Rural electrification in Africa. Zed Books, London.

Meadows, K. 1998 *A gender analysis of energy development, Western Cape, South Africa* Unpublished PhD thesis, University of London, UK

Meadows, K 1987 *Education, Conflict and Development, Experiences from the East Cape South Africa 1983-1986* Unpublished thesis, University of Oxford, UK

Moloto, M. 2003. Eskom, Polokwane. Personal communication.

MUNEE. 2003. The alliance in Moldova. Www.ase.org/programs/international.

One World Design. 2000. China journal 1. Www.one-world-design.com/articles.

Postlethwaite, R. and Thomas, R. M. 1980. Schooling in the Asean region: Indonesia, Malaysia, the Philippines, Singapore and Thailand. Pergamon Press, Oxford.

Poston 2003 DFID Education Advisor, Personal Communication

Puttaswamaiah, E. 1990. Poverty and rural development – planners, peasants and poverty. Intermediate publications.

Republic of South Africa. 1996. The South African Schools Act (84 of 1996). Government Printers, Cape Town.

Republic of South Africa. 2002. National Education Policy Act (No. 17 of 1996). Government Printers, Cape Town.

Save The Children. 2003. Education in Kenya. Www.savethechildren.org/.

Sheffield, J. R. 1973. Education in Kenya: an historical study. Teachers College Press, New York.

South African Department of Education. 2003. Major strategic priorities for the next five years. Http//: education.pwv.gov.za

Taubman, P. and Wales, T. 1974. Higher education and earnings: a report prepared for the Carnegie Commission on higher education and the National Bureau of Economic Research General Series 101. McGraw-Hill Book Company, San Francisco.

Thirwall, A. P. 1990. Growth and development with special reference to developing economies. MacMillan, London.

Thom, C., Davis, M. and Borchers, M. 1995. Review of South African experience in rural electrification. Energy and Development Research Centre, Cape Town.

Thomas, R. M. and Postlethwaite, R. 1983. Schooling in East Asia, forces of change. Pergamon Press, Oxford.

Tindimubana, A. 1994. Science and technology in African education: focus on information technology. In USAID Proceedings of the Atlas conference on education in Africa – resources and linkages.

Todaro, M. P. 1997. Economic development. Longman, London.

Tyhali, M. 2003. Ukanya School. Personal communication.

United Nations Development Programme (UNDP). 1997. Energy after Rio: prospects and challenges. United Nations Publications, New York.

United Nations Development Programme (UNDP). 1989. Education and training in the 1990s. United Nations Publications, New York.

World Bank. 1996. Rural energy and development: improving energy supplies for 2 billion people. The World Bank, Washington DC.

World Bank. 1995a. Priorities and strategies for education: a World Bank Review. The World Bank, Washington DC.

World Bank 1995b. Energy strategies for rural and poor people in the developing world. The World Bank, Washington DC.

Zille, H. 1999. Media package education policy debate. Western Cape Minister of Education.

Appendix B

Gender in South Africa

CONTENTS

B1 **Review of key reports and methodologies for Gender-Energy-Poverty Linkages (South Africa)**

B2 **Stakeholder Consultation – South Africa**

B3 **Findings from the field trial and initial comments on methodology**

B4 **Summary Report from Methodology Workshop on Gender-Energy-Poverty Linkages (South Africa)**

Appendix B1
Review of key reports and methodologies for Gender-Energy-Poverty Linkages (South Africa)
Wendy Annecke[4]

December 2003

INTRODUCTION

In South Africa the links between gender-energy- poverty were observed and described using participatory and qualitative methodologies rather than quantitative. Indeed there have been very few studies which have collected primary energy data from poor households on a quantitative scale, and none of these have been gender focused.

Thus this review is limited to assessing the usefulness of qualitative and participative methodologies to the design of a quantitative gender-energy-poverty study. The paper mentions other key energy studies which did not have had a gender focus, but which collected some gender disaggregated data which has been used to explore gender-energy-poverty questions.

It has proved extremely difficult to get sight of questionnaires used in any of the studies mentioned. Questionnaires are treated as the property of the project and/or the funder and are not placed in the public domain, or, in a somewhat contradictory vein, have not been kept. This shortsightedness has meant that there is no standard format for capturing essential domestic energy data, and that the development of each survey is a new initiative. The survey used in evaluation of the Shell-Eskom Solar Home Systems project took three people four moths to develop. Another, developed and used by Elize Gothard for the evaluation of a Solar Home System project in KwaZulu-Natal has been made available, but is not for general use. Some projects, such as Electricity Basic Service Support Tariff (EBSST) declined to make their questionnaire public, others simply have not kept records and the original questionnaire is not available. In studies where participatory methods have been used, the results of these – seasonal maps, daily time use charts, appliance ownership maps, are usually appended to the study, but are of little use without skilled interpretation and analysis.

Although there was a blossoming of gender-energy-poverty studies from 1990-1998, gender-focused studies have become rare in the past five years, and there has been a general neglect of primary data collection from households in South Africa. The last investigation of fuel use patterns in Khayelitsha was done in 1995 (Davis & Ward 1995), at the beginning of the roll-out of electricity to formal and informal dwellings. A follow-up of the gender-energy-poverty

[4] Wendy Annecke can be contacted at glo-worm@iafrica.com

nexus and shifts that may have taken place (and indeed the pilot study has shown to have occurred), is over-due.

South Africa has a reasonable record of conducting gender-energy-poverty research in the 1990s (*Energia News* 6.1 October 2003) focuses on women/gender and energy studies in South Africa). Gender-energy-poverty research has been conducted thus far largely by women researchers located in academic institutions (EDRC at University of Cape Town, University of Natal, Rhodes, Witwatersrand), NGOs and private organizations (Minerals and Energy Policy Centre, Energy and Development Group, Palmer Development Group, rural energy concessionaires), and the Department of Minerals and Energy.

Some expertise has been developed in reflecting on the gender-energy-poverty issues at stake, and how to tackle them. For example there has been debate about whether energy projects and policy should meet women's practical or strategic energy needs, and whether lightning women's burden with labour saving devices serves primarily to entrench gender roles (Makan 1994). There have also been arguments about whether the empowerment of women is possible through energy-access strategies such as the electrification programme (James 1998) and solar cookers (Green &Wilson 2000). In order to facilitate and target programmes for equity for women in the energy sector (both as consumers and decision makers), strategic leverage points have been located (Annecke 2000), and training in gender-sensitive data collection for all energy researcher has been mooted (Hooper-Box et al 1998). However none of these conceptual papers involved primary data collection.

Primary data collection on gender-energy-poverty studies has relied on small samples - always under 50, but often around 20 households or individuals, and qualitative and participative methods. The qualitative methodologies have usually included structured or open-ended interviews or narratives. Participative methods have included:

- resource maps;
- 24 hour days;
- Venn diagrams;
- seasonal calendars;
- wealth and well-being maps;
- transect walks;
- diary or schedules kept by respondents;
- focus group meetings, workshops and community meetings.

One of the problems of using participatory methods appears to be the volume of information which various exercises elicit. Researchers are frequently unable to relate the rich detail directly to the question at hand or unable to interpret and analyse the rich descriptions in ways which would be useful to the research topic. This means that fairly simple analyses and conclusions are drawn, not very different to those attained through structured questionnaires. Participatory methods have been widely used to solicit gender information (Mehlwana & Qase 1997; Annecke 1993; Green & Wilson 2000; Wentzel 2000) but as the Gender Review of the solar cooker project discovered, participatory methods are not inherently gender sensitive (PDG 1997; Annecke & James 1997).

There were two primary reasons for gender-energy-poverty studies developing through qualitative research and they are interlinked. The first is that women researchers started doing household energy research which focused on women as users. These women researchers identified themselves as feminists and had qualified as social scientists rather than engineers. Therefore their training had been in social science methodologies including anthropology and (what were considered) feminist methodologies – qualitative and participatory - rather than the large-scale quantitative methodologies used by engineers at the time The second reason was a desire to highlight the inadequacies of the survey methods of the time, and demonstrate other ways of collecting rich and useful information which focused not on energy use, but on women as energy users (that is the demand rather than the supply side). In the early 1990s this was a novel approach, and changed the way households were conceptualized and domestic energy was understood in South Africa.

Before presenting the key studies and methods two points need to be made. Firstly it should be noted that all qualitative studies have been careful to set their work against the backdrop of the larger conditions, be this a broader assessment of conditions in a particular shack settlement (Ross 1994), or the socio-economic conditions of a particular province /nation/ region (Annecke 1996; PDG 1997; Crawford Cousins 1998). There is recognition that the big picture should not be lost while examining the minute details.

The second point is that women/gender-energy-poverty researchers observed and described the links in this nexus rather than analyzing them. It seemed clear that because of their traditional gendered roles women had (or took) responsibility for domestic chores of cooking, cleaning and child-care all of which required one or other energy service. Probing why women fulfilled this role drew veiled responses of ‘it is our custom/ tradition’ (James 1995). This exposition has not been taken much further by energy researchers, although possible solutions, such as whether to tackle men, women, or access to energy, have been debated. It also seemed clear to energy researchers because it had been shown that women had least access to food, housing, education, jobs, credit, law courts etc, that poor black women, and particularly poor black women in rural areas, were ‘at the bottom of the pile’, and this did not need to be further explained. In-depth interviews tended to confirm these perceptions, for example in the early 1990s, participatory methods and participant observation led to the women researchers coining the term ‘energy poverty’ (it is not an exclusively South African term), to capture the observed a lack of sufficient energy to fulfil daily requirements for water heating, cooking and cleaning of poor women, and the survival strategies that women, as the mangers of household fuels, adopted to cope with energy poverty. These included cooking more food than required and eating it slightly warmed or cold the next meal (day), buying and cooking less food because fuel had to be bought at the same time, cooking refined staples, and/or buying bread rather than cooking. Little rigorous work has been done to try and analyse the material links between gender-energy-poverty. South African researchers have been much more interested in trying to define gendered power relations, how these affect access to resources (including such aspects as the ability to command labour in the household), and in trying to find strategies to deal with power hierarchies.

The South African women/gender and energy literature for the decade 1990-2002 can be divided into the following:

1. Monitoring evaluating and assessment of energy use patterns, in particular pre- and post- electrification, this would include reports based on fieldwork: paraffin and wood studies, farm workers as a special category, the social determinants and rural electrification reports mentioned below, a comparison between the satisfaction of grid and off-grid customers, energy and income generation (James 1996; James & Ntutela 1998; Hansmann et al 1996; EDRC 1998; Annecke 1998, 1998b; Qase 1999).

2. Conceptual papers – reflections about gender issues and/or policy. This includes:
   - contributions to the Green and White Papers,
   - Makan (1994) on a gender framework
   - James's work on exploring the silences in development theory, and the possibilities of empowerment in the electrification process (James 1995, 1998a)
   - Crawford Cousins' (1998) consolidation and interrogation of rural electrification knowledge
   - Annecke's (2000) concept paper for the UNDP, and
   - the gender framework suggested by Hooper- Box et al (1998).

   Of interest to this study are two papers in this category which theorize issues of women's space and identity with regard to cooking and nurturing roles (Annecke 1993, 1999).

3. Project reports on solar installations: Solar Home System, solar geysers, solar cookers (Nkambule 2000).

4. A miscellaneous category which would include Ruiters' (1995) audit of the location of women in the energy sector and the women's energy budgets (Makan 1995; James & Simmonds 1997).

Only the first and third categories are of particular interest to this study. The following section looks at key studies and methodologies that have assessed domestic energy use and included some gender component, or are considered useful for a quantitative study.

KEY RESEARCH PROJECTS, METHODOLOGIES AND REPORTS

1. The Census

A national census is conducted every five years (the last one was done in 2001) and includes up to five questions about energy use. There is no gender focus or analysis of energy use by gender. Nonetheless this survey should be mentioned because it provides a picture of national trends in energy services and fuel use against which to measure other data. Electricity, LP Gas, paraffin, candle and wood use are accounted for.

2. EPRET 1992-1994

This was a two year research programme which delivered some 25 papers and underpinned the new dispensation's national energy policy. It used secondary sources and was directed at identifying policies which would widen access to basic energy services for the urban and rural poor at the household level. Having been criticized for being 'gender blind' (Makan

1994: 5), a conceptual paper on gender was added to the series and the importance of primary research at the household level was acknowledged:

> *The project would have been strengthened considerably by one or more studies that focused explicitly on the dynamics of household decision-making around energy use. Such a micro-based study should consider not only the microeconomics of different energy options facing households but also social determinants of energy demand. These are the factors such as those described in Chapter 3, related to gender dynamics around decision making for energy and appliance purchase.* (Eberhard & van Horen 1995: 203)

The authors of the EPRT study acknowledged the role of gender relations in decisions about energy as discussed in the work of Makan (1994: 2, 8), Annecke (1993: 49), James (1992: 1) and Ross (1994: 44). They admitted that the practical examples of gender relations influencing expenditure patterns on fuels and appliances that are raised in these studies have implications for policy makers and should therefore have had more attention paid to them. This influential study provided the space and legitimacy for primary data collection in the following two longitudinal studies:

3. The Role of Electricity in the Integrated Provision of Energy to Rural Areas: 1995-1997

This project was designed to assess the impact of the national accelerated electrification programme in rural areas. It involved a series of case studies which evaluated the impact of electrification on different sectors: agriculture, small and micro enterprises, health and the electrification of clinics (Bedford 1998a), education and the electrification of schools (Gordon 1997; Bedford 1998b). It explored a variety of supply options such as selection criteria for rural electrification projects, financing, limited supply capacity (2.5 A, 8A and 20A) and conducted pre- and post electrification studies, moving well beyond the boundaries of households (James 1997; EDRC 1998). Although there was no particular gender focus in the design, women, as teachers and nurses, were central to the use of rural connections in schools and clinics, as well as key beneficiaries of household connections. A variety of methodologies were used at the local level, primarily one-on-one interviews and focus groups. Pre- and post- electrification studies were done at two sites (Hansmann et al 1998; Thom & Wentzel 1998). A flat rate tariff and a limited current supply option were being tested and both proved unpopular. The sample size was, in both cases, under forty households.

4. The Social Determinants of Energy Use in Low-Income Households in Metropolitan Areas: 1995-1997

This was a national, three year longitudinal study which explored a variety of variables, including gender, which were hypothesized to constitute obstacles to greater use of electricity in urban areas. It was undertaken by a team of anthropologists in four metropolitan areas. In-depth interviews were conducted with participants in addition to a number of participatory methods designed to elicit perceptions about electricity use. The primary findings showed that multiple-fuel use was likely to continue in the medium term, and although age, gender, cultural practices, and social status played a role in selection and use of fuel, income and practical factors, such as the cost of internal wiring, were paramount. All sample sizes were under 40 at each site (White et al 1997).

5. Monitoring and Evaluation of the roll out of Solar Home Systems 2000-2003

The Energy and Development Research Center is responsible for the monitoring and evaluation of the roll out of Solar Home Systems (SHS) in three concession areas of South Africa. Fieldwork was done in all three areas in 2001/2 and a follow-up study of one the areas in the Eastern Cape has recently been completed. The questionnaire from this follow-up study is appended. The study is not gender-focused, but data has been collected with reference to gender differences and some gender analysis will be possible. However, to date no report on the findings has been issued.

One of the concessionaires has done their own impact studies, and results of these are available on the web (www.raps.co.za). The results are interesting, but of limited use to a urban, gender-focused study. A comparison of cooking fuels may be useful because sample sizes are larger and altogether the EDRC study will be able to provide an analysis of the energy use patterns of 895 rural households. Qualitative methods including focus groups were used along side a 34 page questionnaire.

Maphephetheni has constituted a separate study area. It is a rural community west of Durban where some 52 households have SHS systems. Maryanne Green has tried to use the Harvard system to collect data in this area, (it was designed for agricultural surveys so has had to be adapted to energy use), and has attempted a gender analysis of the use of solar cookers through data collected in interviews (Green & Wilson 2000).

6. Electricity Basic Service Support Tariff (EBSST) 2002-2003

This is one of the few urban / peri-urban studies currently underway. The assessment of the success of the introduction of the Electricity Basic Service Support Tariff (the 50kWh ‘free’ electricity) in two pilot sites is potentially useful information for this study. Although the questionnaire is not available, papers are currently being written from the extensive data captured at the two sites. The sample size was 40 households, and gender disaggregated data was collected which will allow for interesting analysis. For example the project leader has reported that head of household is no longer an interesting or relevant question, because if there is a man he will be listed, but this gives no indication of his social or economic status, and that women are articulating their independence in a number of different ways; claiming head of household status may not be one of these.

7. Impact assessments of solar technologies

Solar water heaters and thermal insulation have been introduced in small pilot projects in urban areas. Impact studies are being done, but although women are likely to hold specific views on the installation of hot water systems and the efficacy of insulation, gender disaggregated data was not collected (Nkambule 2000).

8. Solar cookers

Solar cookers were introduced in three hot dry areas of the Northern Cape where wood fuel is scarce and solar radiation excellent. It was hypothesized that the adoption of the new appliance would be facilitated by these local conditions. Considerable effort went into

familiarizing the community and women in particular, with solar technology. A gender review of the solar cookers using participative methodologies with about 15 households in each village showed partial success in terms of acceptance, and relative time-saving (PDG 1997). Time and small amounts of money saved were devoted to community and church projects.

The second phase of the programme involved manufacturing selected solar stove models in South Africa, distributing them through existing sales and distribution channels to a specific target group, and monitoring sales in order to establish the profile of solar stove buyers and users, the motivation for the purchase and use of solar stoves, the socio-economic impact of solar stoves and to provide user feed back on the products to designers and manufacturers.

A system had to be created whereby the contact details of a solar stove purchaser could be obtained after a purchase had been made. For this, a warranty card was designed and included with every solar stove. The warranty card served as a guarantee for the product as well as a method to obtain contact details of buyers, in order to include them in the end-user database and to use them in end-user monitoring. The postcard system had some inherent shortcomings. The most obvious shortcoming is that not all postcards from sold solar stoves are returned. In taking sales figures as at the end of October 2001 into account, 24% of postcards were returned.

Another shortcoming of the postcard system was that postcards were not adequately completed, information became obsolete – e.g. people had moved, phone numbers changed, etc. Approximately 10% of database entries were found to be faulty or obsolete. In addition two separate monitoring groups had to be established since the returned postcards (database) contained only information from what is considered the secondary target group for solar stoves (middle to high income, electricity users, urban, environmental enthusiasts). The primary target group for solar stoves is considered to be rural households with low to extremely low household income, wood fuel dependent and/or multiple fuel users. A small monitoring group was established in Huhudi (a township outside Vryburg), representing the primary target group while the database respondents were considered to be representative of the secondary target group.

In this way the acceptability of solar cookers was assessed and a class and gender profile of users developed (Wentzel 2003).

CONCLUSIONS

Close observation, participative methods and in-depth interviews are the most common methods used by South African energy researchers to determine gender-energy-poverty relations. No quantitative studies have been attempted.

South African researchers have been most concerned with household power relations as an indicator of (i.e. as a proxy for) gender status (Ross 1994; Wentzel 2003). The method selected for assessing power relations has been through an examination of the roles and processes involved in decision making. The crude hypothesis her being that in poor households the decision to purchase electrical appliances is a significant one, representing a critical proportion of the household expenditure. Researchers have been interested to discover what appliances are purchased, and in what order, and have been quick to interpret

to whom the benefits accrue most immediately or most visibly, and to use these as an illustration of power relations and influence in the household (Crawford Cousins 1998).

In theory electrification extends the potential choice of appliances considerably, although in practical terms affordability remains the deciding factor (Annecke 1994: 100). The literature shows that the range of first electric appliances purchased varied from one area to another. Some women showed a lot of determination in saving money from their earnings in order to purchase cooking appliances (James & Ntutela 1997). A significant number of households in Loskop had bought electrical cooking appliances before any other appliances and in two cases hotplates were the first and only appliances bought by households (Hansmann et al. 1996). Households with a variety of demographic and gender characteristics as well as higher and lower income households were included in this sample so it could be deduced that the women who made these decisions have the authority to do so. To this end a matrix has been developed which identifies key decision making points in the daily gender-energy-poverty nexus, which may be a useful way of collecting gendered data. One of the disadvantages of this system is that naming a decision-maker may not elucidate reciprocal arrangements; the 'give-and-take' of power. Such an instrument would have to be supported by qualitative methods as well as a questionnaire designed to probe this and other leverage points in the household.

REFERENCES

Annecke W 1992. An in-depth investigation into the use of domestic fuels by urban women in three areas in the Durban Functional Region, report for the Department of Mineral and Energy Affairs, Pretoria.

Annecke W 1993. Energy use by women in an urban environment but without access to electricity: a comparison of three areas, paper presented at the conference on Global Change and Social Transformation, Pretoria, 22-24 November.

Annecke W 1999. From the kitchen to the boardroom: reflections on power relations in gender and energy practice and policy, paper presented at the conference on Improving Women's Access to Energy: Policy, Projects or the Market? University of Twente, Enschade, The Netherlands, 2-3 November, abridged in *Energia News* 2000. Vol 3 Issue 3 pp10-12.

Annecke W 2000. Women and energy in Africa: concept paper for the UNDP. Energy and Development Research Centre, University of Cape Town.

Annecke W & James B 1997. Review of the gender review of the GTZ solar cookers field test 1997, for the Department of Minerals and Energy

Annecke W 1996. The post-electrification study of Loskop –synthesis report. Energy and Development Research Centre, University of Cape Town.

Annecke W 1998. Assistance to NREL regarding the non-economic determinants of energy use in rural South Africa. Energy and Development Research Centre, University of Cape Town.

Annecke W 1998b. Benefits of electrification to rural households: real or potential? in *Journal of Energy in Southern Africa,* Vol 9 Issue 4 pp120-124.

Annecke W 2000b. Assessment of the impact of the Southern African Power Pool (SAPP) on the poor of the region. Energy and Development Research Centre, University of Cape Town.

Bedford L 1998a. Electrification of clinics in Region E, Eastern Cape. Post-electrification study in AmaNtshangase, AmaNdengane, Ludeke and follow-up in Mnceba. Energy and Development Research Centre, University of Cape Town.

Bedford L 1998b. Electrification of schools in Region E, Eastern Cape. Post electrification study in Ludeke and follow-up in Mnceba. Energy and Development Research Centre, University of Cape Town.

Crawford Cousins C 1998. A question of power: the electrification of rural households. Energy and Development Research Centre, University of Cape Town.

Davis M & Ward S 1995. Household energy-use patterns in rural areas: the effects of access to electricity. Energy and Development Research Centre, University of Cape Town.

Eberhard A & van Horen C 1995. *Poverty and power: energy and the South African state.* Pluto, London.

EDRC (Energy and Development Research Centre) 1998. Rural electrification in South Africa: Summarised research from the project *The role of electricity in the integrated provision of energy to rural areas*. Energy and Development Research Centre, University of Cape Town.

Gordon A 1997. Facilitating education in rural areas of South Africa: the role of electricity and other sources of energy. Energy and Development Research Centre, University of Cape Town.

Green, M., and Wilson, M. 2000. The empowerment of women through the introduction of solar ovens in Maphephethe, Kwazulu- Netal, paper presented at the Second World Solar Cooking Conference, Kimberly, 26-29 November

Hansmann C, Van Gass M, Annecke W, Despins PM & Kargas S 1996. Post-electrification study of Loskop - Appendices. Energy and Development Research Centre, University of Cape Town.

Hooper-Box C, Mabuse K and Ruiters W 1998. A conceptual review and reassessment of South African energy policy research methodology: towards an expanded framework for gender and energy research. Report for the Department of Minerals and Energy No. EO9610, Pretoria

James B 1995. The impact of rural electrification: exploring the silences. Energy and Development Research Centre, University of Cape Town.

James B & Ntutela P 1997. Rural households' response to the 2.5A electricity supply option in the Tambo village pilot project. Energy and Development Research Centre, University of Cape Town.

James B & Simmonds G 1997. Energy, in Budlender D (ed) *The second women's budget*. Idasa, Cape Town pp200-248.

James B 1996. An assessment of the pre-electrification process in the Tambo village pilot project. Energy and Development Research Centre, University of Cape Town.

James B 1997. Current-limited supplies of electricity in the context of South African rural areas. Energy and Development Research Centre, University of Cape Town.

James B 1998. Are equity and empowerment possible in a rural electrification programme? Energy and Development Research Centre, University of Cape Town.

Makan A 1994. A gendered perspective of the development context for energy planning in South Africa. EPRET paper No3. Energy and Development Research Centre, University of Cape Town.

Makan A 1995. A women's perspective of the energy budget, paper presented to the Parliamentary Portfolio Committee, Cape Town, April.

Mehlwana AM & Qase N 1995. The social determinants of energy use in low-income urban households. Energy and Development Research Centre, University of Cape Town.

Nkambule, T. 2000. Outcome of the consumer response survey conducted in Ivory Park, Midrand, presented at the Women in Africa African Energy Ministers' Conference, Durban, South Africa, 11-13 December.

PDG (Palmer Development Group) 1997. Solar cooker field test. Final report. Palmer Development Group, Johannesburg.

Qase N 1999. Energy provision for the urban poor: South African case study. Energy and Development Research Cntre, University of Cape Town.

Ross F 1994. Transforming transition: exploring transition theories in the light of fuel use in a squatter settlement, in *Journal of Energy in Southern Africa* Vol 4 No 2 pp26-30.

Ruiters W 1995. Affirmative action in the energy sector. EPRET paper No 21. Energy and Development Research Centre, University of Cape Town.

Thom C & Wentzel M 1998. The 2.5 amp electricity supply option: some experiences in Mafefe, in *Journal of Energy in Southern Africa* Vol 9 No 1 pp18-20.

Wentzel M 2003 A gender profile of solar stove buyers and users: Findings from the second phase of the GTZ/DME Solar Cooker Field Test Programme in Energia News 6.1 (forthcoming)

Wentzel, M. 2000. Renewable energy technology transfer: socio-cultural impacts, in *ENERGIA News*, Volume 3, Issue 2, June, p7-10

White C, Bank L , Jones S and Mehlwana M 1997. Restricted electricity use among poor urban households, in *Development Southern Africa* Vol 14 No3 pp413-423.

Appendix B2
Stakeholder Consultation – South Africa
Mark Borchers[5] and Wendy Annecke

Discussions were held with the following stakeholders during November / December 2003:

Person	Organisation	Expertise
Tony Golding	National Department of Minerals and Energy, Pretoria	National policy, household energy.
Nomawethu Qase	Independent consultant, Pretoria	Household energy, social determinants of energy use, energy and gender.
Gizela Prasad	Energy & Development Research Centre, University of Cape Town	Household energy surveys, questionnaire surveys.
Marlett Wentzel	Palmer Development Group, Pretoria	Household energy (urban and rural), solar cooking, use of coal in low-income households.
Robert Aitken	RAPS, Pretoria	Social determinants of energy use in low-income households, energy and income generation.
Thio Makhabane	Independent consultant, Johannesburg	Energy, poverty and gender (urban and rural).
Khamarunga Banda	Minerals and Energy Policy Centre, Johannesburg.	Household energy, poverty and gender (mainly rural).
EDRC focus group (Jocelyn Miller, Nthabi, Audrey, Yachika)	Energy & Development Research Centre, University of Cape Town	Undertaken questionnaire surveys on household energy, gender and energy, small project on cooking in low income areas.

Synthesis of key issues emerging from stakeholder discussions

The stakeholders consulted are considered amongst the most experienced regarding energy and gender issues in South or Southern Africa. They covered the main energy research organisations around South Africa, national government, independent consultants active in

[5] Mark Borchers, Sustainable Energy Africa can be contacted at mark@sustainable.org.za website: www.sustainable.org.za

related areas, and individuals that have been involved in relevant projects. Fields of activity included policy research, household energy and questionnaire survey specialists, and energy project implementation. Almost all were women.

In general, those consulted could provide less detailed insight into gender and energy issues amongst the poor in South Africa than was hoped. While many of the stakeholders consulted have more general experience with energy and households, projects that have gender and energy as a core focus are less common, and quantitative gender studies are rare. However, at a general level everyone is aware of some of the main dynamics in this area. As one researcher put it: 'gender issues inevitably raise their head' even if not a specific focus of a particular study. The overall result was that people were able to point to the likely key questions, but could provide little in the way of insight into the dynamics around them. This finding in itself is useful, as it points to the need for more targeted research into this area, particularly in South Africa, and also apparently in the entire Southern African region.

Consistent with the findings of Wendy Annecke in her overview of suitable methodologies used in South Africa, stakeholders interviewed could identify no quantitative methodologies which were directly relevant, and only a few which might inform this work in a less direct manner. In fact, during the discussions, there was a constant reminder that information on the household energy picture around the country is sadly lacking. Many isolated studies enable one to assume some of the core trends in this regard, but one is generally unable to quantify these with any certainty. Important questions remain unanswered:

- Who makes the decisions regarding energy purchases and appliance purchase?
- How has this changed recently?
- Is there a trend in electrified households to using electricity for cooking?
- What are women's preferences in this regard?
- Are men helping with cooking?
- How are gender relations changing in households? Why?

Some useful issues emerging from the stakeholder discussions are summarised below:

The gender landscape is changing

There is broad consensus that gender roles and relations are changing in households, particularly in urban areas. For example there was a general sense that women are more involved in appliance purchasing decisions than in the past. In Orange Farm (a township near Johannesburg), there was evidence that some households refer to the female as the household head, even though she has a male partner living with her. There was less consensus on how and why these dynamics are shifting. Some indicated that women are stronger because they are more informed on their rights, are more exposed to non-traditional gender roles through the media, and have more 'clout' because they often are earning whereas the men may not be. Others thought that gender roles may be changing as a matter of necessity because women are apparently more sought after employees and thus are more likely to find jobs where men cannot. They are thus in the home less, and some domestic duties thus inevitably are taken up by men.

Linked to this is the apparent changing composition of households. It is more common to find households comprised of three or four women, or mainly men, for example. Reasons for this are unclear. One small survey undertaken in an area near Cape Town found it very difficult to determine household size because there was a steady influx of friends and relations from other parts of the country staying on the property.

Employment & income – the big issue

There was a high degree of consistency amongst those interviewed that the most critical issue that emerges from fieldwork is the need for income. People want jobs more than they want free electricity. "You can't tackle energy problems without first tackling poverty" said one policy researcher. It is easy to underestimate the debilitating impact of poverty in low-income areas. Substantial use of electricity, often considered the most desirable 'destination' along the energy ladder, is often unaffordable to households. The main factor may be the expense of appliances (one study suggested that a R120 hotplate was unaffordable to many, and could take 6 or more months to pay back), but also the cost of purchasing units of electricity. The minimum purchase of electricity is R5, whereas paraffin can be purchased in R 2 or R3 batches if necessary. Yet more than one study reveals a general preference to cook with electricity, even though the constraints are such that in reality it is not happening on a significant scale.

One big issue arising out of the above is 'how can energy provision help promote economic growth'? This is not a new question, yet it remains important. Substantial work has been done in this area in the past, including in South Africa, and by now the finding that 'energy is a necessary but not sufficient condition for economic growth' is almost a cliché. It is clear that looking into this area requires a highly integrated approach, not just an energy focus. But is this a gender issue? In the words of one stakeholder, "I'm not convinced that the empowerment of women can happen without greater access to financial resources and opportunities". However it is probably not appropriate to try and cover this issue in a small project such as this which is largely focused on methodology development.

Time as a scarce resource

Several stakeholders interviewed indicated that it is important to understand how women in particular spend their time, and what sort of time pressures various duties or activities impose on them. From here one can begin to explore the question of whether energy can free up time in activities such as cooking, and thus reduce the burden under which women may find themselves. This issue is complex however, and at this point there appears to be little clarity on the issue in South Africa. Studies such as the rural EnPoGen[6] work in Asia indicate that electricity freed up women's cooking time, but that this time seemed to be used doing other chores, rather than improving their quality of life through more time for leisure or income generation activities. A study in the rural Limpopo Province in South Africa also indicated that women's time was freed up to some extent where they used electricity to cook (presumably due to reduced time collecting wood), and the 'free' time seemed to be spent 'doing nothing' (presumably leisure?) rather than being more productive, which the research

[6] EnPoGen is the acronym used for the Energy, Poverty and Gender Initiative funded by the World Bank's Asia Alternative Energy Program (ASTAE). Further details of this work are available at: www.worldbank.org/astae

was trying to explore. However these studies do not go into enough depth to understand the reasons behind these shifts in time allocation.

A few researchers interviewed thought that in fact time is very often not a scarce resource, largely because of the high proportion of people unemployed. While the official unemployment figure for Cape Town is 20%, one estimate suggested that it is as high as 68% in a particular area. So time may often not be a scarce resource to households.

One group of researchers indicated that many black women have been brought up to keep themselves busy with chores. Sitting and reading or relaxing was frowned upon. This conditioning does not change easily, and thus reducing the time burden of one 'chore' does again not necessarily lead to more leisure or improved quality of life, but women may just busy themselves with other work. It appears that this situation may be changing, as the younger generation of women are often brought up less 'traditionally'.

Also, in rural areas in particular, there is a certain 'rhythm of the day' where chores are linked in with social interaction in an established and integrated manner. For example collecting water at the water point, or gathering wood, can also be a time for social interaction with the neighbours. Within this framework freeing up time for a particular chore does not necessarily lead to more leisure or income generating time. The situation in urban areas may be substantially different, but whether and how it differs is not known.

It is clear that, as with many other questions relating to gender and energy, the issue of time allocation and scarcity is not well understood in South Africa.

What do women consider 'a burden'?

Some researchers mentioned that this question is more complex than may be thought. With having a core role in running a household comes a certain power, and, for example, 'relieving women of the burden of cooking', would come with reduced power and influence in this area. This may be undesirable to many women.

Qualitative vs quantitative research methodologies

Most stakeholders interviewed saw the value in a quantitative approach to the energy-gender relationship in poor households, and some considered it a critical component in raising the profile of these issues. However, at least in South Africa, an understanding of the dynamics behind gender issues is still lacking, and there are more questions than answers in this regard. Thus stakeholders interviewed often pointed to the limitations of quantitative questionnaire surveys, particularly when exploring complex issues such as those around gender relations. With a quantitative approach, trends can be identified such as 'who does what chore', and 'how long different tasks take', but understanding reasons behind this, which are essential to considering policy or other interventions, are less easily fleshed out with questionnaire interviews. This can be overcome to some extent by using skilled enumerators who have adequate background to pick up and explore these issues in a bit more depth, but this becomes difficult in large surveys. One stakeholder interviewed thought it worthwhile starting with a qualitative approach on a particular issue, and thereafter designing and implementing a quantitative approach.

Air pollution link with cooking and thermal energy services

Indoor and outdoor air pollution is a big problem in South Africa, and particularly in the Gauteng and other areas where winters are cold and coal is used for thermal energy needs. It is apparently more common for women, children and the aged to remain indoors during cold weather, and thus they are likely to be more seriously affected by the indoor pollution.

Men need as much help as women

Some stakeholders interviewed pointed out that men also suffer from energy poverty, particularly in these times of rising unemployment. Also, with the changing gender relations in many households, some men apparently feel displaced, and are threatened by the fact they no longer hold the role of household head by default. This is the traditional role many were brought up to play. The situation is exacerbated when the women have jobs or other sources of income but men don't. These are thought to be some of the factors linked to the current level of violence against women.

The implication is, some stakeholders felt, that men need as much help as women, and are an equally valid gender focus.

Children also important focus

A substantial part of a woman's role in the household is linked to childrearing. This potentially links to the question of gender and energy through the issue of competing time demands for say cooking and attention to children, and also because children (mostly girls?) may help with the cooking, and thus share in the 'burden' and also the health impacts from the poor air quality.

Cooking is 'the big issue' regarding gender and energy

In spite of a changing gender landscape within households, there was consensus that cooking is the most important issue regarding gender and energy. This is one of the last areas that remain squarely a woman's domain in the vast majority of households. In terms of household energy use, cooking (and also other thermal energy needs to some extent – water heating and space heating) is more fundamental, more linked with health and survival, than other energy services. It takes more time than other energy-related activities during the day, consumes a substantial amount of energy (and thus expense when compared with lighting and media), is responsible for much of the significant air pollution and resulting health impacts (women, children and grannies standing over the stove), and has a big role in nutrition.

Conclusions

It is clear that there is a general lack of any detailed research, qualitative or quantitative, on gender and energy issues in poor households. Yet it is widely considered necessary to attempt to address the many unanswered questions. Arising from the discussions with key

stakeholders as represented above, amongst the key areas where gender research would be useful are:

- The gender landscape in households is changing – women seem to have a stronger role in some areas, but why? And how exactly is it changing? How is this affecting decision-making regarding appliance purchase, for example, and who does the chores such as cooking?

- Employment & income – this is a key concern. Does energy have a significant contribution to make in income generation and job creation? What is this contribution?

- How do women spend their time in the household? What is considered a burden by women? How can energy help free up time, or reduce the 'burden'?

- Men & energy – do men face particular energy-related 'burdens'? What are these and what can be done about them?

- Is cooking a particular burden to women? Would electric cooking improve the situation? It there a preference to use electricity for cooking (as reported)? Should this be facilitated? What are the constraints to such facilitation?

From the above, the latter question is considered most appropriate as a focus for this study. Not only is it a core gender issue, but it provides a more discrete focus for the work, whereas many of the other issues are rather broad, and may require substantially more resources to probe successfully. Cooking is widely regarded as the one area that remains a woman's domain, and absorbs a substantial amount of time. It also is a significant financial burden as it is a relatively high energy demand activity, and is a contributor to poor indoor air quality and thus respiratory ailments. Cooking is also a core part of nutrition, and is thus a fundamental component of basic welfare in the household.

In addition, the issue of electricity use and cooking is particularly relevant from an electrification policy perspective. Huge resources have been invested in the massive National Electrification Programme (NEP), which connected most households to the national grid in the late 1990s. Economically it is important that this investment promotes the welfare of households as much as possible – i.e. that electricity is used wherever it can improve the situation of households, particularly poor households. Also, the financial returns on the NEP investment are maximised when average household electricity consumption increases. The average has been much lower than expected to date. The use of electricity for cooking would increase consumption markedly, and potentially have a substantial impact in this regard. There is thus substantial policy interest in this area from national government, Eskom (the national utility) and others.

It therefore seems appropriate that the key question that should form the focus for the development and testing of a methodology that effectively explores gender-energy-poverty linkages should be:

“Does electricity improve women’s life regarding cooking and their other chores in the household?”

Whether the impact is positive or negative or there is no change, the research methodology also needs to be able to examine why and how any changes have been brought about, and the provide insight into precise nature of the change that has occurred

Appendix B3
Findings from the field trial and initial comments on methodology
Mark Borchers and Wendy Annecke

The aim of the limited field trail was to test the initial methodology consisting of both quantitative questions for data collection and open, qualitative questions to explore a number of key issues in more depth. A substantial amount of information was gathering as a result of the field trial and this generated a wide range of findings (it should be noted that these are not based on statistical sampling and as such provide only indicative findings in each of the areas studied). A number of important methodological recommendations were also made by the enumerators, and as a result of examining the collated data.

B3.1 Findings

Composition of households

- Average household size: 5.4
- Households where 'husband and wife' (or couple in similar relationship) were present: 50%
- Proportion of 'female headed' households: 50%
- Average no. females in house: 3.3
- Average no. males in house: 2.5

It is generally accepted that the traditional 'nuclear family' may no longer be regarded as the norm, and the 'household' is becoming an increasingly amorphous concept. Anecdotal evidence is that there are households consisting of a few women only and of men only, however none of the latter were interviewed in the survey study.

Employment & income profile

- Household members in permanent employment: 16%
- Household members in temporary/casual employment: 16%
- Household members as pensioners: 9%
- Household members unemployed: 23%
- HHs with income R500 p.m. or below: 26%
- HHs with income R1000 pm or below: 58%

Income figures are probably unreliable, as often energy expenditure was a disproportionately high component of the income. Unemployment figures appear consistent with official statistics for Cape Town, which are around 20%. One official source indicates that 26% of households in Cape Town are living 'below the breadline' (earning below R1000 p.m.). This is an average figure, and thus includes mid- and high-income households. This survey suggests that this proportion of unemployed is higher, although it covers only a relatively poor area.

The overall picture is one of poverty and struggling households.

Energy consumption

- HHs using electricity: 100%
- HHs using paraffin: 35%
- HHs using LPG: 15%
- HHs using coal: 0%
- HHs using wood: 0% (in fact 20% of households use wood, but intermittently and in small quantities)

(Note – the above LPG and paraffin figures reflect summer use. In winter paraffin heaters are extensively used, for example)

- Av expenditure on electricity: R182 pm
- Av expenditure on paraffin (those using): R48 pm
- Av expenditure on LPG (those using): R44 pm
- Av total energy expenditure: R206 pm
- Av total energy expenditure as proportion of income: 20% (this figure is consistent with other studies in low-income areas, but is nevertheless considered unreliable)

It is clear that almost all household energy needs are provided by electricity. There is no clear trend when household electricity consumption and time connected to electricity are compared (although all households have been connected for more than 8 years, and do not appear to be wanting for basic electricity appliances – see later. There were no 'new users' in the sample).

The results on electricity use above suggest a significant change to the current knowledge and ideas about energy use. This knowledge is based on data which is more than 8 years old. A study of low-income household energy use done in Cape Town in 1995, showed continued dependence on paraffin despite electrification, and to date this has been held to be the norm in electrified households.

Buying energy - gender issues

- Decision making around buying electricity: 80% women
- Fetching/buying electricity: women 24%, children 24%, no trend 41% (a mix of family members – neither significantly male of female)
- Paying for the electricity: men 25%, women 55%

Women appear to have a strong role in decisions around buying energy and paying for it.

Buying energy - problems

- HHs that have problems buying electricity: 85%
- Very few households experience problems buying/getting paraffin of LPG where these fuels are used. 'Vendors running out of electricity' was cited as the most common problem in purchasing electricity, followed by the vendors being far away - particularly the 24 hour vendors, which are often used.

The proportion of households that have problems with electricity purchasing is significant and may affect electricity consumption.

Main energy consuming activities in the household – perceptions
Cooking and water heating were thought to be the major consumers of energy in the household, although some households considered ironing amongst the highest. Almost all respondents considered that they used more energy in winter for heating the house.

Energy preferences for cooking and heating

- HHs preferring electricity for cooking: 85%
- HHs preferring paraffin for cooking: 0%
- HHs preferring LPG for cooking: 15%

Electricity is clearly considered the best energy source for cooking. Reasons given were mainly that it is quick, convenient, clean and healthy. 74% of households said they'd rather not use paraffin for cooking, mainly because it is dirty and unhealthy. There is a fear amongst some households of using LPG.

- HHs preferring electricity for heating: 22%
- HHs preferring paraffin for heating: 61%
- HHs preferring LPG for heating: 17%

Paraffin is generally considered preferable for heating the house, mainly because it is cheap and effective. Electricity is considered relatively expensive for this purpose, and gas is often considered dangerous.

It is interesting that paraffin maintains its position as the preferred space heating fuel, even though electricity dominates the overall energy consumption picture. Other responses in the questionnaire indicate that one of the reasons for using paraffin heaters is that one can cook or heat water at the same time. It is also clear that electricity is considered relatively expensive. The problems almost all households appear to find in purchasing electricity also contribute to this situation.

Appliance ownership

Electric appliances	
Lights	100 %
Heater	35%
Hotplate	5%
Stove/oven	95 %
Microwave	70 %
Iron	100 %
Fridge	95 %
TV	95 %
Hifi	100 %
Kettle	100 %
Frying pan	65 %
Geyser	35 %
Washing machine	15 %
Hoover	10 %
Computer	5 %
Video	10 %

Paraffin appliances	
Lamp	5 %
Cooker – wick	15 %
Cooker – pressure	0 %
Heater	70 %
LPG appliances	
LPG lamp	0 %
Cooker – ring	5 %
Cooker – stove	10 %
Oven	5 %
Heater	10 %
Fridge	0 %
Wood appliances	
Stove	0 %
Coal appliances	
Stove	0%
Mbawula	0 %

- Electrical stoves, fridges, TV and microwave ovens are owned by the majority of households. These are not cheap appliances (even when purchased second-hand), and it is noteworthy that even low-income electrified households are able to accrue most of the important appliances over time. The only common non-electric appliance appears to be the paraffin heater.
- When asked which appliances the respondent (always a female) still wanted to obtain, washing machines and geysers were most commonly mentioned, as they make life easier and save time. They were considered unaffordable at present.
- When asked which appliances the family (as opposed to the respondent) still wanted, a video, DVD, computer and geyser were most frequently mentioned. The children (not gender specific) were most frequently thought to want these.
- 21% of women said that men had 'stopped' them getting a particular kitchen appliance, either by withholding money or having different priorities. 74% said men had never stopped them getting a kitchen appliance.

The survey does not point to a clear gender bias regarding appliances acquisition. The evidence does not support the perception that appliance purchases are biased towards to preferences of the man in the house, and thus the woman's burden is not alleviated by, for example, electrification, to the extent that it might be. The fieldworkers were of the impression that where women had been 'stopped' from buying the appliance they wanted, that this decision was discussed and put on hold for financial reasons.

Cooking different meals

- Women supervise cooking in 90% of cases.
- Breakfast is cooked regularly only by 45% of households, and takes about 25 minutes on average.
- Breakfast is usually cooked by women or daughters.
- Lunch is cooked regularly only by 10% of households, and takes about 20 minutes on average.
- Supper is cooked regularly by 100% of households, and takes about 70 minutes on average to prepare.
- Supper is usually cooked by women in 56% of households (daughters 17%, no trend 28%). Daughters help with supper most commonly (54% of responses).

Pre-cooking

- Buying pre-cooked meals is not a common practice (60% never buy, 40% sometimes buy).
- Pre-cooking in the house is more common - 63% of households sometimes pre-cook meals themselves, and 16% often pre-cook meals.
- 80% of households think pre-cooking is a good idea, usually because it saves time and electricity.

Women & cooking

- Respondents (women) that like cooking: 85%
- Respondents (women) that don't like cooking: 15%
- HH member choosing food to be cooked: 85% women

- Women said they liked cooking usually because they could see to their families' nutrition and they were used to cooking – it is their 'habit'. Those that didn't like cooking said they were tired, and had no time.
- Only 5% of women said they don't get enough help with cooking.
- Approximately half of women (45%) would like someone to take over the main responsibility for cooking. Reasons given were that they would have more time for other activities, or are tired. When asked who should take over this responsibility, the daughter or the 'whole family' were most commonly mentioned.
- Those that did not want others to take the cooking responsibility (55%) indicated that this was because the family likes their cooking, they like cooking, they would like to see to their family's nutrition, or that others would not do it well.

Women had to think about whether they would want someone else to take over the cooking: it was a novel idea to most, and just under half answered in the affirmative. However they wanted to hand over to daughters or 'the whole family' which might perpetuate traditional gender roles rather than begin to shift them. However 'the whole family' needs probing, as do the responses that indicate that more than half the women wanted to retain the responsibility for cooking. Until there is greater clarity about the issue, care should be taken when asserting that cooking is a burden to women. Further probing of the ideas of 'a burden', of sharing the responsibility and the possibilities offered by the notion, should be done using participative methods rather than survey questions. Focus groups, role play and/or well-being maps may throw light on this topic and indicate considerations which would be useful to future policy making.

Time spent on various activities

- 75% of women have enough time for cooking, 19% do not.
- Washing, cooking and cleaning are the three activities that respondents said take most time during the day.

The above findings again indicate that further probing is needed to understand what is meant by 'enough' or 'not enough' time, whether employed and unemployed women respond differently, the degree to which each of the time consuming tasks is considered a burden and what women think could be done about it. Again there is a limit to the extent these can be answered in a questionnaire, further understanding of the issues at stake would require a more qualitative assessment.

The kitchen space

- Women who want to improve their kitchen: 68%
- Ways of improving the kitchen mentioned were additional cupboards, kitchen space, table and chairs, and additional appliances. (Results from this question may be unreliable because initially many women couldn't think of whether or how they would improve their kitchens, and only responded positively after some discussion and being given examples by the enumerators).
- Women said they didn't improve their kitchens because they couldn't afford to.

Food cooked

- Vegetables, samp and meat were most commonly considered important foods to cook, usually because they are seen as nutritious, easy to cook, or the family liked them. Approximately a third of households mentioned that don't cook some foods they'd like to cook. The main reason given was that the food was unaffordable.

No clear links between energy or appliances and food cooked or nutrition are apparent.

Energy & cooking

- Almost all houses use electricity as the primary cooking energy (90%).
- 85% of households use an electric stove/oven, and 55% use a microwave in addition as a 'second' appliance. The electric stove is also considered 'the best' cooking appliance by 75% of households, usually because it is quick, clean and easy to use. It does more than one pot at a time and can also bake. The microwave is also well liked, usually because it cooks and warms. Knowledge of efficiency was not probed.
- Paraffin cookers are generally not liked, usually because they are dirty and unhealthy, and about 10% of households listed LPG appliances as 'not liked' because gas is seen as dangerous.
- 50% of households sometimes run short of electricity 'sometimes'. Reasons for this are generally because they run out of money to buy electricity, or aren't keeping track of how much is left.
- When estimating the proportion of total energy being used for cooking, 62% of households thought that about half of energy consumption went to cooking.

There is significant concurrence that the electric stove/oven is 'the best' cooking appliance, and that paraffin is not suitable for cooking.

Electricity & cooking

- 86% of households used paraffin for cooking before starting to use electricity, while 14% used LPG.
- Only one household (5% of sample) still uses paraffin regularly for cooking.
- Compared with energy sources being used previously, electricity is considered-
    - quicker by 89% of respondents
    - more expensive by 63%
    - cleaner by 95%
    - more convenient by 95%
    - safer by 95%
    - healthier by 95%

It appears that women consider that they are paying more for cooking with electricity, but are prepared to do it because of all the other benefits associated with using electrical cooking appliances.

Fridges & food

- 100% of households consider a fridge to be important (fridge ownership is 95%).
- The main reasons for this were keeping perishables fresh, storing cooked foods, enabling pre-cooking, and enabling bulk buying.

- 95% of respondents said 'the whole family' benefits from the fridge – no particular individuals or genders were indicated.
- Meat, vegetables, cooked food, dairy products and water/juice were the most common items kept in the fridge.
- Respondents said a fridge has changed-
    - the food cooked (100% of respondents) - more nutritious foods, more meat, provides access to other foods
    - how often food is cooked (85%) because food can be pre-cooked and stored
    - how food is bought (100%) because it can be purchased in bulk.

Fridges are clearly an important benefit of having access to electricity, and almost all households have obtained fridges and use them well. It is interesting that LPG or paraffin fridges were not encountered or mentioned.

Heating the house

- In 60% of cases the woman is primarily responsible for heating the house in winter.
- Paraffin is the predominant heating fuel – it is used in 74% of cases.
- Paraffin is considered 'best' for heating by 45% of households, LPG by 35%, and electricity by 10%. Paraffin is preferred in winter because it can be used for heating and cooking at the same time, and it is cheap and effective. However paraffin heating is not liked by about 50% of households because it is dirty and unhealthy, and LPG heating is not liked by 35% of households mainly because it is seen as dangerous. Electric bar heaters are considered expensive.

There is an interesting tension around the use of paraffin for heating households. On the one hand it is widely used because it is cheap, versatile and readily available in affordable quantities, and yet it is clearly recognised by users as being dirty and unsafe.

B3.2 Important questions taken to the methodology workshop: Does the questionnaire probe these adequately?

The findings from the field trial left a number of important questions partially or completely unanswered and also identified other issues / questions that had not been addressed using the initial questionnaire. The following questions were taken to the methodology workshop for further discussion of the approach (quantitative vs qualitative) and the nature of the questions:

Is cooking a burden to women?

The information gathered indicates that cooking may not be as significant a burden as previously assumed for most women. The majority of women appear to like cooking, feel that they have enough time for it and have adequate help. However, cooking is amongst the most time consuming activities of women, and just under half the women say they would like others to take on the responsibility of cooking.

Does the questionnaire provide enough clarity on the issue for us to come to a conclusion? This is one area where the questionnaire needs to provide very sound evidence if possible, since the implications are far-reaching. Can a survey do this?

Are women centrally involved in decision-making around domestic affairs?
Anecdotal evidence indicates that 'things are changing' regarding women's role in running the household - that some men are doing some cooking, some child-minding and picking up other parental duties. At the same time gender-based violence is on the increase in South Africa and child-abuse is rife. Probing the possible correlations was beyond the scope of the study, and the methodology used was not designed to pick up this information, but rather to pick up a few specific areas of decision-making, preferences and areas of discontent (or content).

Different perspectives on the changing roles are missing from this study and are difficult to explore through a survey. Participative methods are required to what changes are taking place and how this affects energy use. A major short-coming of this study was that, despite prior recognition of the shortcoming, only women were interviewed. Since gender involves relationships both partners in the relationship should be interviewed. The high number of women headed households (that is where no male is present) where women make their own decisions implies thinking through which men should be interviewed and why.

The information gathered in this survey indicates that women are centrally involved in several areas of the domestic activities explored. In fact a sense emerges that they 'run the household'. They often seem to decide which appliances to purchase, and often pay for them as well. There is very little evidence that they aren't able to obtain a particular appliance because of the different priorities of men. In fact, in spite of being obviously poor, most households have a fairly complete set of electrical appliances which support the 'running of the household' – such as electric cookers and fridges, and even microwaves – which current wisdom tells us is within the domain of women . Where domestic appliances were still wanted by women, such as washing machines and geysers, the reason for not obtaining them was affordability, and no evidence was found to suggest that it was linked to different priorities of men, although children were understood to exert pressure to acquire items such as videos and DVDs.

Women also appear to make most decisions around cooking, including food to be cooked (although the questionnaire didn't explore this latter issue in any detail).
However, the decision-making process is probably more complex than can be easily captured in a simple 'woman or man decides' type question. Can/should the questionnaire explore these in more detail? How? Should the budgeting process be explored more fully? Is this feasible in an already lengthy questionnaire? An argument can be made for capturing numbers through such a survey and then probing process through participative methods.

Does electricity improve the welfare of women?
It is important that the huge investment in the national electrification drive is as socially beneficial as possible, in particular to poor women, who are often considered amongst the most marginalized group in society. This methodology was designed to probe the benefits of electrification in alleviating the burden of women's primary domestic tasks.

Evidence from this project indicates that electricity may have taken over the role of the main energy source in low-income households. Those interviewed have a surprisingly large range of appliances, including many that appear important to the cooking function – which still remains the woman's domain. Electric cookers (stove/oven) and fridges are in most households, and microwaves are also common. It is clear that electricity is the energy service of choice in just about all instances, except that it is too expensive to use for heating in winter.

It is worth noting that all households have been connected to electricity for at least 8 years (while houses in Harare township of Khayelitsha have only been built in the last 2 or 3 years, they were connected as shacks around 1995), and therefore the project did not cover any very new electricity users, where appliance ownership and therefore benefits of electricity may differ greatly. (This is an area worth exploring since there is a disjuncture between apparent income and appliance ownership - could it be that the second-hand market is now so flourishing that it is easy to get relatively cheap core electrical appliances?).

Overall there is evidence that electrification has resulted in significant benefits to households. The questionnaire would need to be rolled out into a statistically valid survey in order to provide evidence for all areas of benefit. One nagging doubt is whether the households interviewed were as poor as they appeared. Income levels are notoriously difficult to ascertain to a reasonable degree of accuracy. Can poor households really be so well stocked with appliances? Is it feasible to improve the accuracy of the 'income' section of the questionnaire?

Another area of concern is whether the apparent increasing use and dependence on electricity is beneficial from all angles? The respondents in this project were clear that they considered electricity expensive, and buying electricity is almost universally considered problematic because of vendors running out of electricity, distance to vendors, and generally poor service from vendors, amongst other reasons. Electricity prices are set to rise with the introduction of the Regional Electricity Distributors, and alternatives for poor communities, who are investing in electrical appliances, have not been forthcoming. The supplier in Khayelitsha (PN Energy) has not complied with the government's instruction to provide 50kWh of free electricity to each customer, and this is another angle to watch.

Does electricity reduce the safety and health aspects of significant paraffin use?
Paraffin use is associated with unacceptable levels of indoor air pollution, poisoning of children, and incidence of fires (although the latter applies mainly to informal settlements). Evidence from this project suggests that electricity increasingly becomes the dominant energy source in households, and so paraffin use probably decreases. It seems reasonable to assume that indoor air quality problems and paraffin poisoning of children should decrease. Should the questionnaire explore this more specifically? Is it feasible using such a tool? Should it be left to air quality and health professionals?

What is the impact of HIV / AIDS in the area of gender and energy?
The questionnaire did not include any questions about HIV/AIDS status or any special requirements of the households pertaining to the illness. This is a very sensitive issue, but since South Africa has amongst the highest infection rates in the world, it is not sensible to undertake any social research, planning or policy making without taking the pandemic and its

effects into account. The question to take to the workshop was how to include this in the questionnaire in a way that was pertinent to the gender and energy question.

B3.3 Initial comments on methodology

B3.3.1 Shortcomings of the quantitative approach

The limited field trial has indicated that it is difficult to explore complex relations such as those inherent in gender, though simple questions. It recognised that quantitative approaches to the typically complex issues around gender and energy will be limited because of the inability for questionnaires to probe the particular relations and processes that become apparent. For example, the respondent may answer that the 'woman' **decided** that a microwave should be purchased. This is probably a gross simplification of the dialogue and process involved in coming to this decision. A respondent gives an answer that electric cooking is preferred because it is safer and cleaner than paraffin. Quantitatively it is not easy to explore this further, but in a qualitative process it may be possible to probe the threshold at which such a transition is made.

Thus, key conclusion on the methodological approach for exploring gender-energy-poverty linkages drawn from the field trial is that this should make use of quantitative data collection in conjunction with qualitative (open) questions, and accompanied by other participatory qualitative methods.

Qualitative work can add value to probing of the research question (see Appendix B4, Sections 4.5 and 4.6 for further discussion) providing enhanced understanding of current issues such that suitable questions and questionnaire may be designed (thus adding significant value to the quality of data collected). Once the questionnaire data is processed, qualitative methods should be used to flesh out important issues that emerge. For example, following from this project it may now be useful to undertake qualitative work to further understand gender roles in the appliance purchase process and household budgeting, and to explore why households believe that paraffin is cheaper for heating, and whether other solutions can be found.

B3.3.2 Where the questionnaire could be improved

Length of questionnaire

The pre-pilot version of the questionnaire took about 40 minutes to complete in an interview. The expanded final questionnaire took about an hour and a quarter to an hour and a half to complete. This is often too long for people to spend 'doing nothing'. It can easily result in rushing, both from the enumerator and the respondent. This may well compromise the quality of the data. For example, the appliance table on the current questionnaire should really be filled in carefully, particularly the parts about who makes decisions around purchasing, but with so many questions to work through, the tendency is to do this superficially. In addition, it may be considered impolite to walk into someone's house and expect him or her to take more than an hour of the day answering questions whose purpose is not clear to the respondent.

On the other hand, the enumerators reported that at the end of the interview almost all respondents were happy to keep chatting about some of the issues raised in the questionnaire, as they found them interesting and enlightening. In the interests of reciprocity the enumerator is obliged to engage, however the time pressure is still there and the quality of data may be compromised.

Repetitiveness
In general the reasons given by respondents for preferences or choices around appliances were common to the type of energy, rather than the appliance. There was thus effectively a significant amount of repetition in the answers, and little new was learned in some sections. The enumerators also realised that respondents thought they were asking the same questions over again, and thus were uncomfortable and sometimes did not fill out the answers in any detail.

Time
The section of the questionnaire seeking to find out how people spend their time during the day, and thus hoping for some insight into where the 'burdens' lie and how energy may help address these, is too superficial to achieve such insights. It is useful at this level, but a detailed exploration that is probably necessary to clarify these issues is unlikely to fit into such a questionnaire easily. A time use study as well as 24-hour maps would be useful in this regard.

B3.3.3 Specific edits to the questionnaire to be considered

The following section should be read in conjunction with the refined and annotated questionnaire (Appendix E1.2)

Questions around BUYING ENERGY:
Answers given on decision-making regarding buying the different fuels are almost always the same, so it may be feasible to condense this section.

Which APPLIANCES are in the house?
Responses for 'Who buys' and 'Who decides' is almost always the same – consider condensing section.
The benefits of all of the electrical appliances are very similar, so one learns little new from asking for each electrical appliance. Consider condensing.
The benefit of 'convenience' is often stated, but what this actually means isn't really clear. This could possibly be fleshed out more.

COOKING
There is no apparent link between food type cooked and energy. While this could be considered a useful finding in itself, it may not be worth including such questions.

ENERGY & COOKING
The reasons that respondents give for using a particular appliance, for choosing a 'best' appliance, and for choosing an appliance they would rather not use are generally very similar and little new is learned. This section could be condensed.

ELECTRICITY & COOKING – "Is cooking electricity…."
The enumerators reported that the 'Why' part of these questions do not work. Prompting is often required to get information, and respondents are sometimes bored or impatient by this time. Answers also don't yield anything new – much of this info has been gained in earlier questions.

Another question raised (rather than answered) was what does 'convenient' mean? This isn't answered usefully. This row in the table is best deleted.

B3.3.4 General comments and suggestions from enumerators

- Enumerators should have basic training and understanding of energy issues.
- Where possible, they should also be aware of the social, economic, and political situation in the community.
- It is useful to talk to authorities such as community groups before starting the fieldwork, so the work has their support and the 'word can be spread' to some extent as to the nature of the project. This can also help the 'cold canvassing' not be quite as 'cold'. Such authorities can also provide useful background information on the communities.
- Enumerators should be briefed on how to act, what greetings and introduction to use, what to wear, what attitude they should convey, they should be trained in people skills and generally being sensitive to their environments.
- Research is information sharing. Therefore it is necessary to take into account that questionnaires may take longer than anticipated due to the nature of conversation generated.
- Consider paying enumerators per day rather than per questionnaire. The latter may encourage them to rush and not allow the conversation to develop.
- Enumerators should explain to respondents why certain questions are being asked – e.g. income (so can work out % of income spent on energy) – to make people feel more comfortable in answering them.
- It is important for enumerators to be fluent in Xhosa or the local language as applicable.

Appendix B4
Summary Report[7] from Methodology Workshop on Gender-Energy-Poverty Linkages (South Africa)
Workshop held in Cape Town
Tuesday 20th January 2004

B4.1 Objectives and process at the workshop

The primary objective of the workshop was to assess the effectiveness of the methodology and make recommendations in this regard. To this end the following agenda was set:

- Introduction of participants
- Introduction of project and this study's place in the larger DFID/FES programme
- Presentation of findings from the literature and key stakeholder interviews
- Presentation and discussion of the key research questions which the methodology was trying to address
- Presentation of the methodology and the findings from the questionnaire interviews
- Discussion of the methodology with respect to its success in addressing the key research questions
- Making of recommendations on modifying the methodology to address the necessary research questions, including the balance between qualitative and quantitative approaches.

B4.2 Participants

The workshop participants were as follows:

Denise Oakley – Future Energy Solutions – gender and energy specialist
Wendy Annecke – Human Science Resource Council - gender and energy specialist
Mark Borchers – Sustainable Energy Africa - energy specialist
Tieho Makhabani - independent gender researcher – member of SAGEN, the Southern African Gender and Energy Network
Khamarunga Banda - Mineral and Energy Policy Centre, AFREPREN representative
Winifred Mandhlazi - GTZ - work with women & energy, and HIV/AIDS
Sarah Ward – Sustainable Energy Africa – energy and gender specialist
Fakiswa Mahote – Development Action Group – fieldwork facilitator
Thoko Mashiloane – Sustainable Energy Africa - fieldworker
Audrey Dobbins – Masters student at the Energy Research Centre – undertaken work on women, cooking and energy
Yashika Reddy – Masters student at the Energy research Centre– undertaken work on women, cooking and energy

Apologies:

Tony Golding -Department of Minerals and Energy
Molatelo Montwedi – Department of Minerals and Energy
Marlett Wentzel – Palmer Development Group
Monwabisi Booi – City of Cape Town Energy Advisor
Hazel Ranniger –Energy Research Centre – researcher
Gisela Persad – Energy research Centre - senior researcher

B4.3 Introductions, presentation of literature review and interviews

[7] Report prepared by Mark Borchers and Wendy Annecke based on the valuable contributions of all participants of the workshop

The introductions were made and the study contextualized as part of a larger programme so that all participants understood the starting point. The literature review included studies done by many of the people attending the workshop and who had been interviewed prior to the question being set. Thus there was agreement about gender and energy being under-researched and the need for empirical evidence of linkages. This specific study was introduced as an endeavour to develop a quantitative methodology for exploring gender and energy linkages in poor households. The rationale for the research question was explained thus: Cooking is established as a key task which reflects the construction and practice of gender roles, and uses energy for its fulfilment. Traditionally in energy and development literature cooking is seen a major burden for women. Hypothetically access to electricity lightens women's domestic burden and makes cooking easier if appropriate appliances are available. Questions around cooking and appliance ownership and use were selected as a starting point for a study exploring linkages between gender, energy and poverty.

The availability of appliances is dependent on the ability to make the decision to purchase the appliance and on its affordability. Authority to make decision-making is generally thought to be a signifier of status in the household or power relations between men and women. Appliance acquisition is thus believed to throw light on gender relations and priorities within the household. The workshop was in agreement that the research question was important in the light of present knowledge, although, as will be seen, discussion of the findings of the survey brought very different perspectives to bear, and there is a suggestion for a paper to be written which re-visits several concepts. These concepts have developed and evolved over the last twenty years but they continue to be used and understood in rather tired ways. Their meanings need to be re-defined. These include the notions of 'gender', 'burden', and 'gender relations' – the latter in the light of the hostility it still raises and with reference to the increasing number of women headed households, and what this means for electricity use and appliance purchases.

B4.4 Key research questions and the methodology explored

The methodology attempted to explore the key research questions below. However it was realised from the outset that many of the questions posed involve far more detailed research, and even other methodologies, than was possible in this project. This was confirmed when the questionnaire was piloted, when it became clear that to obtain adequate information in all areas was beyond the scope of what could be achieved with one questionnaire. Already the questionnaire length was such that both enumerators and respondents were uncomfortable with the time taken to complete it, and so to extend the questionnaire to cover particular areas in more detail was not an option, as overall data quality would suffer.

B4.5 Summary of fieldwork results and methodology assessment

In this section the findings of the questionnaire are explored in terms of the key research questions. More detailed results from the questionnaire survey can be found in the Appendix B3. Important discussions and methodological conclusions from the workshop are also detailed.

It should be remembered that the fieldwork did not cover a big enough sample to enable projections onto the entire Khayelitsha area with an acceptable degree of statistical certainty, but rather conducted sufficient questionnaire interviews to test the methodology as well as to identify key patterns regarding gender and energy in poor formal households. It is nevertheless interesting to note that the high degree of consistency of many of the responses are strong indicators of the likely overall situation in the broader target group, and are thus highly significant in themselves.

The key research questions are dealt with below. (These are the overarching research questions, not those posed in the questionnaire.)

Q1: What household chores are considered a burden by women?

In this project various burdens were assumed based on currently held views by experts in the energy sector, and thus the specific assumed 'burden' area of cooking was focused on in the questionnaire.

However the fundamental understanding of 'a burden' and what household chores are considered burdensome was not explored in the questionnaire in detail. This was for several reasons. Firstly, research undertaken prior to the fieldwork indicated clearly that the core energy-related burden of women was widely assumed to be cooking, and so this was focused on from the start. Secondly, the questionnaire pilot, which did attempt to explore the question in more detail, showed clearly that to achieve reasonable clarity in this area would be more demanding than could be accommodated in this project. The question is a conceptual one, broader than gender and energy, which are the foci of this project, but essential to our understanding for gender and energy planners and policy makers. This fundamental question requires urgent attention and re-visiting in the light of the questionnaire findings which throw doubt on some commonly held ideas around what is considered a burden by women. A study done in South Africa in 2000 throws some light on this finding and could be used as groundwork. The lesson for methodology is that all assumptions should be tested prior to the start of fieldwork so that the questionnaire is accurately designed to focus on specific areas.

Relevant findings
The final questionnaire asked which tasks women found took most time during a week. The responses indicated that the following were consistently regarded as most time consuming:

- Washing
- Cooking
- Cleaning

Workshop discussion

- Various findings from the survey suggested that researchers in general are not clear what represents a burden for women. This is recognised as a critical knowledge gap, because directing further research or implementation to address gender issues becomes difficult without some clarity on this issue.
- Workshop participants recognised that the context regarding women's empowerment and energy is changing fast, contributing to the lack of clarity on issues of what women find a burden and how to address this.
- The concept of 'burden' is a complex one. Burdens can be a mix of financial, physical, time or mental and emotional components. In addition, women may not see habitual tasks as a burden initially, but once the matter is raised they may see it differently – either more positively or negatively. The concept of a burden may also change over time and in different contexts.

- The literature may provide some insight into this area, and help define the concept of a 'burden' – although focus groups on current understandings among poor women would be useful in this regard.

Methodology recommendations

- The question of 'burden' was seen as a difficult area to investigate quantitatively (i.e. via questionnaires), and it was considered necessary to define the concept of 'burden' and explore burdensome tasks in a qualitative way (focus groups).

Other recommendations

Given the lack of clarity on this research question, investigation into this area is urgently needed, as it has potentially major implications for energy policy and electrification practice. A written paper was suggested.

Q2: Is cooking a burden to women?

This question is really a sub-question of Q1. It is interesting to note that several researchers interviewed prior to the fieldwork felt comfortable with the assumption that cooking was the core energy-related burden for women, and as such it was a focus of the questionnaire, and was explored in more detail by several questions. However the findings, limited though they are, do not support this view. In terms of establishing and testing a methodology to explore burdensome areas, cooking nevertheless provides a useful focus.

Relevant findings

The questions below from the questionnaire, together with their responses, inform the key research issue (note: all respondents were women):

- Who supervises cooking?
  - Women 90%
- Who cooks the meal?
  - Women 56%, daughter 17%, no trend 28%
- Who helps with cooking?
  - Daughters 54%
- How long does cooking take?
  - 70 min (supper)
- Do you like cooking?
  - 85% yes, 15% no
- Do you have enough help with cooking?
  - 70% yes, 5% no, 25% don't need help
- Would you like others to take over responsibility for cooking?
  - 55% no, 45% yes

The above results are surprising, in that they suggest that cooking is not as significant a burden as is commonly thought. However, it is noteworthy that cooking still appears to remain women's domain.

Proposed response to the research question:

"The responses indicate that cooking may not be a significant burden to women in urban areas with access to electricity for cooking."

Workshop discussion

- On the surface it appears that the question is well covered by the quantitative methodology, as respondents are asked about the issue from a few different angles.
- However workshop participants thought that it was difficult to be clear on whether cooking was in fact a burden or not, or to what extent it was a burden, from the information given. On the one hand women seem to like cooking and have enough help, on the other a significant number (just under half) of women considered that they would like others to take over the cooking function.

- Overall, workshop participants agreed that the area needed to be explored further, and that the common wisdom that cooking is women's primary energy-related burden should be revisited.

Methodology recommendations

- It was considered that this issue should be explored qualitatively (see the previous key research question regarding "what household chores are considered a burden by women?").

Other recommendations

- As with the previous key research question, this is an area that requires urgent clarification through research.

Q3: Does electricity reduce the general burden of women's work in the household?

Based on the findings of Q1, one may begin to explore where electricity or other energy forms have a role in easing such burdens.

Relevant findings

- The surprisingly high level of core electrical appliance ownership suggests that electricity is well used.
- The majority of households have their preferred cooking appliance.
- The majority of households have fridges and consider them important.
- Regarding appliances which the household still wanted, the following main responses were obtained (remember that all respondents were women):
    - What appliances do <u>you</u> (not your family) still want?
        - Washing machine 30%, geyser 17%
    - What appliances do <u>your family</u> (not you) still want?
        - Video 32%, DVD 21%, computer 11%, geyser 11% (although it is significant that when respondents were asked who wanted these appliances, 'men' were seldom mentioned – rather 'children' or 'daughter' or 'sons' – again providing no evidence that there is a gulf between appliances sought after by men and women).
    - The indication is that washing machines and geysers may be the most significant future focus to facilitate further welfare benefits of electrification. This needs further research.

Proposed response to the research question

"While electricity appears to benefit women with regard to cooking, it may have little impact on the other demanding chores of washing and cleaning."

Workshop discussion

- An important precursor to addressing this research question is to clarify tasks that are in fact 'a burden' to women (see earlier discussions).
- The questionnaire didn't explore this area in great detail, but nevertheless the findings may point to a critically important area for further research around maximizing the benefit of electrification for women.

Methodology recommendations

- To explore appliance wants and needs, as well as the real benefits of appliances with respect to gender, qualitative research is necessary.

Other recommendations

- Further research into how appliances can benefit women in areas that they consider a burden is necessary. There is a suggestion from the findings that washing machines may be amongst the most important appliances in this regard.

Q4: What are women's preferences with respect to cooking energy?
and
Q5: Are they able to realize these preferences?

The above two questions shed light on potential barriers to acquiring particular energy sources or appliances. If women are in general not cooking with the energy and appliance of their preference, understanding the reason for this becomes important in considering how to improve their welfare. It is widely held that women prefer to cook with electricity. The fieldwork results clearly support this position.

Relevant findings

- Preferred fuel
  - Electricity 85%, paraffin 0%, LPG 15%
- Preferred appliances
  - Electric stove/oven 75%, microwave also well liked
- Appliance ownership
  - Electric stove/oven 95%, microwave 70%

Proposed response to the research question:

"Many women seem able to access appliances of their choice. There appears to be no serious constraints to women accessing cooking appliances of their choice."

Workshop discussion

- It needs to be emphasized that the fieldwork covered households who had been connected to electricity for 8 years or longer (albeit as informal dwellings for several years). Appliance ownership in newly electrified households may differ significantly. However, in other areas where electrification was due to be implemented shortly, some workshop participants had also experienced unexpectedly high levels of electrical appliance ownership.
- It was generally acknowledged that appliance procurement was a poorly understood area, and required further investigation. There are many potential methods of appliance acquisition, including lay-bye, new purchase, second-hand purchase, 'hand-me-downs' from employers, and even stolen goods.
- It is noteworthy that hotplates are not the preferred electrical cooking appliance, but rather electric stove/ovens. Workshop participants suggested that this may be linked to the status of owning a stove/oven.

Methodology recommendations

- The issue of energy and appliances 'preferences' can be usefully explored quantitatively, and is adequately dealt with in the current questionnaire.
- It was felt that the word 'preference' needed further consideration and unpacking, particularly considering how it may be translated into Xhosa or other languages (in Xhosa it is often translated as 'like').
- General appliance issues in the questionnaire:
    - Consider including whether the appliance is broken or working (although workshop participants generally considered that this was usually picked up when the questionnaire interview was being undertaken, but nevertheless it was felt useful to include one question to this effect).
    - It would be useful to establish how long ago the appliance was acquired. However it was acknowledged that this may extend the questionnaire, which could be problematic.
    - It would be useful to know how particular appliances were acquired (second-hand, lay-bye etc), although this was also likely to be outside the scope of the questionnaire, and required at least some qualitative work.

Other recommendations

- Appliance procurement needs further research. Considering the potentially sensitive nature of some of these issues (e.g. those around stolen goods), this may be best undertaken in a qualitative manner.

Q6: Has electricity made women's life easier with respect to cooking?

This question builds on Q4 and Q5 (regarding 'preferences') in that it explores differences in women's lives arising from electricity provision.

Relevant findings

- Women are able to use their preferred energy source and appliance (i.e. electric stove/oven), as almost all households have them.
- Respondents considered electricity to be quicker, safer, cleaner and more convenient than whatever was being used before electricity.
- Yet cooking electricity is usually considered more expensive than the previous energy source.
- Fridges:
    - 95% have fridges
    - 100% consider a fridge important
    - 85% say it enables them to cook less (can pre-cook)

- 100% say it enables food to be purchased in bulk

Proposed response to the research question:
"Electricity appears to make women's lives easier with respect to cooking."

Workshop discussion

- The questionnaire points to the fact that cooking with electricity is clearly thought to be worth the perceived extra cost of its use. It seems reasonable to use this, together with the stated benefits of electricity, as an indication that electricity does in fact make cooking easier for women.
- The high degree of consensus on the importance of a fridge, and its enabling of pre-cooking and bulk buying, may also be a pointer to electricity's making life easier with respect to cooking, although this is less clear because pre-cooking is not widely practiced, and bulk-buying practices, which necessarily require a higher cashflow and often the availability of affordable transport, are not well understood.

Methodology recommendations:

- This question can be usefully explored quantitatively.
- It is adequately addressed in the current questionnaire, but should also consider including the following:
  - Part of cooking is cleaning up afterwards.
  - Buying the food is also part of cooking.
  - The questionnaire should be clear that the 'cooking time' includes preparation, not just time 'on the stove'.

Q7: Who makes the decisions to spend money on energy & appliances?

Gender roles in the decision-making process are one of the most critical areas to be explored. Common wisdom holds that appliance acquisition is often biased towards the needs of men although results from the pilot fieldwork survey do not support this. The fieldwork suggests that women are in fact much more 'empowered' than is commonly thought with respect to decisions regarding energy and appliance matters in the household. Men's perspective on this is urgently needed.

Relevant findings

- Who decides to buy energy?
  - Women 80%
- Who pays for the energy?
  - Women 55%, men 25%
- Who decides to buy appliances?
  - mostly women
- Has a man ever stopped you getting a kitchen appliance?
  - 74% no, 21% yes

Proposed response to the research question:
"Women appear to be centrally involved in decision-making around key energy and appliances, and there are indications that appliance procurement is not biased towards the preferences of men."

Workshop discussion

- It was acknowledged by the workshop that the decision-making process was often a complex one, and not easily captured in simple questions as posed in the questionnaire. The process includes the budgeting process and management, as well as the dialogue and dynamics between people in the household.

Methodology recommendations

- The issue needs to be explored qualitatively since the complexities of the decision-making process are not likely to be accurately reflected in questionnaire responses.

- Nevertheless it was considered useful to include questions such as those in the questionnaire, but to regard the responses as indicative rather than comprehensive responses.
- The question "has a man ever stopped you getting a kitchen appliance" was felt to be too coarse, and respondents could sometimes not understand what was being asked. More useful questions were suggested as:
    - Do you consult other household members when buying an appliance?
- In addition to the above, it was thought useful to explore questions such as the following qualitatively:
    - Do you always agree on appliance purchase when you discuss appliance purchase?
    - What do you do if you don't agree?

Q8: What are women's preferences with respect to heating energy?
and
Q9: Are they able to realize these preferences?

In addition to cooking, heating also usually has significant energy (and financial) implications for households, and is a substantial contributor to indoor air pollution which is thought to affect women and children most. For this reason it was considered a suitable focus for further testing the methodology.

Relevant findings

- Preferred heating appliance

Paraffin heater 45%, LPG heater 35%, electric bar heater 10%
(Note that this section is methodologically similar to that covering 'cooking preferences', and thus methodology issues were mainly discussed under the former section).

Relevant findings

Heating appliance ownership
    - Paraffin heater 70%, LPG heater 10%, electric heater 35%
- Reasons given for using paraffin:
    - Versatile – can cook and heat at same time
    - Cheaper than electricity
- Yet it is considered dirty and unsafe

Proposed response to the research question:
"Paraffin appears to be the preferred heating energy source for many households (though not the majority), yet there is a tension around using paraffin for heating: it is considered cheaper, but also dirty and unsafe."

Workshop discussion

- Heating the home is clearly one area where paraffin use persists in formal housing.
- It was recognized that that safety problems associated with the use of paraffin are potentially substantial (fires, poor air quality and poisoning of children), and since this is probably the leading cause of poor air quality, it is an important area of focus.
- In spite of the perception that paraffin is cheaper than electricity for cooking, no workshop participants were aware of recent research that clarifies the comparative financial costs of paraffin and electricity. The last known research in this area is very dated.

Methodology recommendations

- The issue of energy and appliances 'preferences' can be usefully explored quantitatively, and is adequately dealt with in the current questionnaire.
- It was felt that the word 'preference' needed further consideration and unpacking, particularly considering how it may be translated into Xhosa or other languages (in Xhosa it is often translated as 'like').

Other recommendations

- Clarity on financial costs of cooking and heating with different energy sources would be useful to researchers and households alike, and should be developed and disseminated.

Q10: Does the provision of electricity make a significant difference to indoor air quality?

The methodology did not aim to explore this question directly, but since it is widely considered a critical issue, and has clear gender implications (women and children are thought to spend most time indoors, especially during winter), it is useful to look at evidence relating to the issue.

Relevant findings

- There is a dependence on electricity for most services.
- Paraffin still widely used for heating.

Possible response to research question:
"Electrification appears to improve indoor air quality during the summer months".
This question requires further targeted research. Monitoring may be an appropriate next step in this regard.

Q11: Is there any evidence that electrification impacts on family nutrition?

This issue was also not explored in any detail, but is also critical to household welfare and thus is worth examining any evidence relating to the question – not only to explore the usefulness of the methodology in this respect, but also to inform or suggest future research.

Relevant findings

- Fridge ownership 95%
- Main benefits of fridge mentioned – keeping perishables fresh, storing cooked foods, enabling pre-cooking, enabling bulk buying.
- Meat, vegetables, cooked food, and dairy products were most commonly kept in fridge.
- Vegetables, samp and meat were common foods. Respondents usually said they are cooked because they are seen as being nutritious, are easy to cook, or the family liked them.
- Approx 30% of households said they didn't cook food they wanted to cook – mainly because it was unaffordable.

Although evidence is presently superficial, it seems probable that there is a link between nutrition and the use of fridges (and thus the availability of electricity – since electric fridges are most commonly used, and are considered more effective than gas and paraffin fridges).
The findings did not suggest that there was a link between the foods cooked and energy source or appliance ownership.

B4.5.1 Other interesting field work results and workshop discussions

The burden of electricity

While the questionnaire findings point to several areas where the benefits of electricity appear to be substantial, it also adds a certain burden to household.

Relevant findings

- Is it a problem to buy electricity?
  - 85% yes (vendors running out of electricity, vendors far away, poor service.). In contrast, problems were rarely experienced in purchasing other energy sources.
- Compared with the cooking energy source used before electricity:
  - 63% consider electricity more expensive
- The main energy source used for heating:
  - Paraffin 61%, electricity 22%, LPG 17%

  - Reasons for paraffin preference for heating:
    - electricity is expensive
    - paraffin can cook and heat at same time
- Unexpected power cuts were often mentioned as a problem.

The findings point to noteworthy inconveniences or other burdens regarding the use of electricity, and this counterbalances the perceived benefits of electricity to some extent. Yet households still clearly prefer electricity, and appear to be prepared to tolerate these inconveniences to enjoy the benefits.

Considering HIV/AIDS in the methodology

Workshop participants considered that there was inadequate information on the impact of HIV/AIDS on households to assess the implications for the methodology.
Several questions, or areas where further exploration was needed were discussed. These included questions such as 'Who in the household needs special care?' Who does the caring? What are the implications for women's burden? What are the possible food/nutrition implications? What are the resulting energy implications (if any)?

Recommendations

- Include HIV/AIDS families into the pilot sample to explore what the implications for the methodology may be. This should be done in conjunction with local AIDS support groups, and must be at least partly qualitative rather than quantitative.

Problems associated with using the term 'gender'

Several workshop participants felt that using the word 'gender' to describe this work area has become counter productive. People often react to it negatively, and it can discourage the participation of men. It was suggested that 'social roles and responsibilities' is a better way to describe the research field. However, others felt that the term 'gender' should be preserved, and rather it's 'image' changed so that people do not find it alienating.

Recommendation

- Workshop participants to explore funding for follow-up meetings and researching the area further. A suitable title for this exploration may be '10 years of shifting social roles and responsibilities in South Africa – gender in demise? and policy implications'.

B4.6 Key features of methodology - Summary of recommendations

The overall methodology is influenced by two broad emerging issues. The first relates to the apparent greater level of empowerment of women relating to domestic matters than is generally acknowledged. In this regard findings of the current project are supported by other research and experiences of workshop participants (see report on synthesis of discussions with key stakeholders). The focus on the 'women' part of the 'gender' research area – previously considered amongst the most marginalized of groups – needs to shift, and a more equal focus on men is appropriate. The size of the sample made it difficult to interview men, but a quantitative survey must interview men and the opinion of the workshop was that the same questionnaire should be used, and emn's opinion of women's burden probed. It would be equally necessary to engage men in focus groups. The increasing levels of gender-based domestic violence reported by some workshop participants provides added reason to shift some of the focus to men and men's perceptions of decision-making around purchasing electric appliances.

A second broad emerging issue relates to changing concepts and in particular the question of what women consider to be a burden. Based on interviews with a range of researchers prior to the fieldwork, cooking was considered the primary energy-related burden for women. However the findings cast some doubt on this, and also highlight the fact that we don't in fact know what the principal burdens are that women face. Clarifying

this is obviously an important first step to exploring how to ease women's burden, and what role energy may have in this regard. The role of cooking in women's identity and self-esteem has begun to be explored and we need to build on this work.

In general, the methodology highlighted some common shortcomings of quantitative approaches, and assisted in clarifying areas where parallel qualitative work is crucial to obtaining an adequate insight into gender and energy issues. Questionnaires generally are adequate to obtain simple reasons for a particular course of action or preference. For example, for those who state that they prefer electricity for cooking, when asked 'why?' may typically respond 'it is more versatile'. While useful, this is a fairly superficial response, and to understand the issue in more depth is difficult via a questionnaire. Qualitative work may be required. This is also true of complex areas such as exploring what tasks are in fact considered a burden, and the process and gender roles involved in decision-making.

Specific methodology recommendations from the workshop are repeated below.

B4.6.1 The influence of the workshop: Methodology recommendations

- The question of 'burden' was seen as a difficult area to investigate quantitatively and it was considered necessary to define the concept of 'burden' and explore burdensome tasks in a qualitative way (focus groups, role play, well-being maps).
- Following from the above point, it was considered that the issue of whether cooking is a burden to women should be explored qualitatively.
- The issue of energy and appliances 'preferences' can be usefully explored in a quantitative methodology, and is adequately dealt with in the current questionnaire.
- It was felt that the word 'preference' needed further consideration and unpacking, particularly considering how it may be translated into Xhosa or other languages (in Xhosa it is often translated as 'like').
- To explore appliance wants and needs, as well as the real benefits of appliances with respect to gender, qualitative research is necessary.
- General appliance issues in the questionnaire:
    - Consider including whether the appliance is broken or working (although workshop participants generally considered that this was usually picked up when the questionnaire interview was being undertaken, but nevertheless it was felt useful to include one question to this effect).
    - It would be useful to establish how long ago was the appliance acquired. However it was acknowledged that this may extend the questionnaire, which could be problematic.
    - It would be useful to know how particular appliances were acquired (second-hand, lay-bye etc), although this was likely to be outside the scope of the questionnaire, and requires at least some qualitative work.
- The issue of whether electricity makes women's life easier with respect to cooking can be usefully explored quantitatively. It is adequately addressed in the current questionnaire, but should also consider including the following:
    - Part of cooking is cleaning up afterwards.
    - Buying the food is also part of cooking.
    - The questionnaire should be clear that the 'cooking time' includes preparation, not just time 'on the stove'.
- The important issue of decision making around energy and appliances needs to be explored qualitatively as the complexities of the decision-making process are not likely to be accurately reflected in questionnaire responses.
    - Nevertheless it was considered useful to include questions such as those in the questionnaire, but to regard the responses as indicative rather than comprehensive responses.
    - The question "has a man ever stopped you getting a kitchen appliance" was felt to be too coarse, and respondents could sometimes not understand what was being asked. More useful questions were suggested as:

        - Do you consult other household members when buying an appliance?
    - In addition to the above, it was thought useful to explore questions such as the following qualitatively (i.e. not in the questionnaire):
        - Do you always agree on appliance purchase when you discuss appliance purchase?
        - What do you do if you don't agree?
- Include HIV/AIDS families into the pilot sample to explore what the implications for the methodology may be. This should be done in conjunction with local AIDS support groups, and must be at least partly qualitative rather than quantitative.

B4.6.2 Other recommendations

- Given the lack of clarity on the issue of what tasks women in fact consider their main burdens, investigation into this area is urgently needed, as it has potentially major implications for energy policy and electrification practice.
- As with the previous issue, this question of whether women consider cooking a burden (or which aspects of cooking) requires clarification.
- Appliance procurement needs further research. Considering the potentially sensitive nature of some of these issues (e.g. those around stolen goods), this may be best undertaken in a qualitative manner.
- Clarity on financial costs of cooking and heating with different energy sources would be useful to researchers and households alike, and should be developed and disseminated.
- Further research into how appliances can benefit women in areas that they consider a burden is necessary. There is a suggestion from the findings that washing machines may be amongst the most important appliances in this regard.
- Further research is required around the HIV/AIDS issue and its impact on gender-energy-poverty linkages.
- Follow-up research is required in the area of changing gender relations. A suitable title for this exploration may be '10 years of shifting social roles and responsibilities in South Africa – a gender in demise, and policy implications'.

Note:
The methodology together with the edited and annotated questionnaire developed as a result of the workshop recommendations is provided within Appendix E1

Appendix C
Education in Uganda

CONTENTS

C1 **Review of Education Literature & Activities: Uganda**

C2 **Uganda Workshop Report**

Appendix C1

Energy to Reduce Poverty

Review of Education Literature & Activities: Uganda

prepared by

PO Box 71608 Kampala Uganda
Phone: +256 (0)41 510792 (landline), +256 (0)77 860257, +256 (0)77 559603
email: rigby@utlonline.co.ug www.voiceinternational.gq.nu

November 2003

1. Introduction and Background 3

2. Uganda 3

2.1 POVERTY ERADICATION ACTION PLAN 4
2.2 POPULATION 5
2.3 ENERGY AND ELECTRICITY POWER SUPPLIES 6
2.4 EDUCATION ISSUES 8
2.5 THE MAIN EDUCATION ISSUES IN UGANDA, 9
2.5.1 Poverty Eradication Action Plan (PEAP) Review 9
2.6 DECENTRALISATION 13

3. Energy for Rural Transformation (ERT) 13

MOES RESPONSE TO ERT 14

4. Other relevant policies 15

4.1 RURAL ELECTRIFICATION STRATEGY AND PLAN (2001 – 2010) 15
4.2 RURAL COMMUNICATIONS DEVELOPMENT POLICY 15

5. Notes on individual projects 16

5.1 I-NETWORK 16
5.2 SCHOOLNET 17
5.3 CONNECT- ED 17
5.4 CURRICULUMNET 18
5.5 UCONNECT SCHOOLS PROJECT 19

6. Measurement of the impact of energy services on educational attainment 19

7. Conclusions 22

8. Recommendations for the way forward 23

8.1 POLICY 23
8.2 RESEARCH ACTIVITY 23

Appendix 1 List of acronyms 25

Appendix 2: list of documents 27

Appendix 3: Map of Uganda 29

1. Introduction and Background

Despite there being a clear cross-cutting relationship between energy and poverty reduction, proving these linkages has been difficult at the sector and project level, especially as energy is a derived demand, making the direct relationship between energy and poverty difficult to quantify.

The education sector is crucial to poverty reduction because poor people themselves think education is very important[8] and it has been agreed as a Millennium Development Goal. DFID is, therefore, seeking to:

- broaden the depth of knowledge and understanding of the education-poverty-energy nexus;
- develop measurable indicators for assessing the education-energy service needs of the poor to support MDG attainment in Uganda;
- investigate what evidence is available to encourage policymakers to promote energy interventions in the planning of education policy to reduce poverty.

Objective of the Paper

The objective of this paper is to produce a comprehensive review of existing literature on current and recent interventions in Uganda on linkages between education, energy and poverty reduction, with a specific focus on the deployment of ICTs in education.

It is hypothesised that increased access to ICTs in schools has a positive impact on student and teacher learning and provides teachers with essential tools and mechanisms to enhance achievement levels of students in the learning environment.

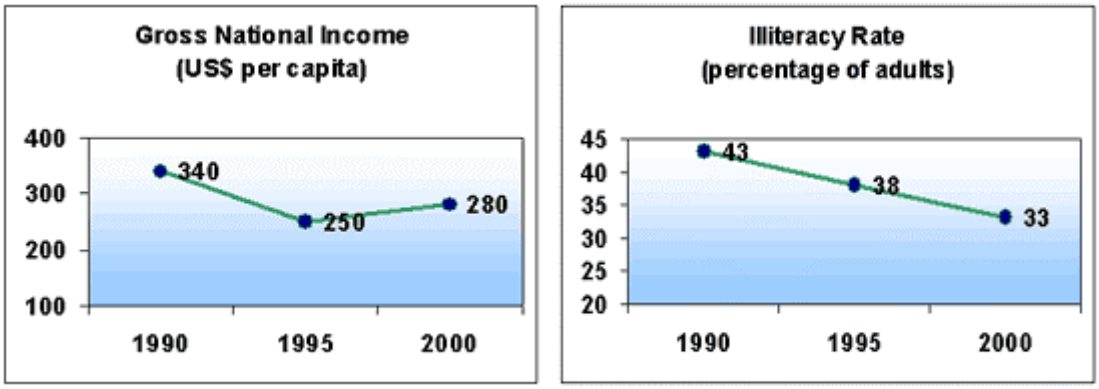
2. Uganda

[9]Uganda is a landlocked country, covering an area of 235,885 sq. km. (see map Appendix 3). It is one of the poorest countries in the world. Per capita income in 2003 is estimated to be at about $259. Life expectancy at birth dropped from 47 years in 1990 to only 43 years in 2001. The percentage of the population with improved access to water remains relatively low at 52 percent in 2000.

Nevertheless, over the last couple of years Uganda has made substantial progress in terms of human development:

[8] UPPAP 2002 page 48 gives 'education/literacy' as one of the key factors the poor themselves feel will help them out of poverty
[9] source: www.worldbank.org – country brief

- Infant Mortality dropped from 100 per 1,000 in 1990 to 79 per 1,000 in 2001.
- Gross enrolment rates* for primary schooling increased from 71 percent in 1990 to 136 percent in 2001
- Total adult literacy rose from 56 percent in 1990 to 67 percent in 2001.
- Total youth literacy increased from 70 percent in 1990 to 79 percent in 2001.
- GDP per capita grew an average 3.6 percent since 1995.



The performance of Uganda's economy at the macro level has been impressive:

Real GDP growth was 6.6 percent in 2002, with a projected growth rate of 5.7 percent in 2003 (with agriculture as the most important sector of the economy and coffee being the most important export good). Inflation decreased from over 33 percent in 1990 to 2 percent in 2001.

2.1 POVERTY ERADICATION ACTION PLAN

Uganda's poverty reduction agenda is defined in the Poverty Eradication Action Plan (PEAP), first formulated in 1997. In fact the government's entire expenditure policy is governed by the priorities of the PEAP. Since 1997 it has been updated twice (in 2001 and 2002[10]). It has been developed through a cross sectoral participatory process and identifies the following national vision and overall goals:

- Reducing absolute income poverty: Increasing income to poor households, and placing a high priority on eradicating income poverty.
- Raising educational achievements: Reducing ignorance as a particularly constraining feature of the lives of poor people; improving literacy and educational achievement among the population at large.
- Improving the health of the people: Increasing life expectancy, decreasing mortality and reducing the effect of illnesses (e.g. HIV/AIDS and malaria).
- Giving voice to poor communities: Giving poor people an effective voice in the design and implementation of public policy.

The PEAP gives the Government's strategic directions which are agreed and supported by donor states either through sector support of general policies, as is the

* this issue is given fuller treatment on page 10
[10] the third evaluation and review is taking place September-November 2003 – see below

case with the World Bank, DFID, EU, Ireland Aid, Netherlands etc or through support of individual projects (USAID, CIDA, Norway, UNESCO etc). The overall situation in the community at large has been monitored by two investigations within the Uganda Participative Poverty Assessment Process (UPPAP I and UPPAP II). The findings of UPPAP II were published early in 2003, contributing to the biennial publication of the Uganda Poverty Status Report. The data for UPPAP II was gathered by using participative processes with poor communities in 60 sites throughout the country.

One of the key challenges in achieving sustainable improvements in poverty derives from still rising numbers of HIV infections. Uganda was one of the first countries to be affected by HIV/AIDS. Sustained efforts to combat the disease at the highest level of Government have resulted in a dramatic decline in the HIV prevalence rate from approximately 18.5% in the early 1990s to 6% in 2002.

Other key constraints to the implementation of the PEAP reform programme are: a high dependence on primary commodities, power shortages and risk perceptions which constrain development and investment (security issues, political transition, governance/corruption).

Politically, the country has enjoyed a degree of stability since 1986, but continuing fear and disruption has been caused by gross insurgency in the Northern half of the country.

2.2 POPULATION

Table 1 shows the population census statistics over the last 55 years

	1948	1959	1969	1980	1991	2002
population (millions)	5.0	6.5	9.5	12.6	16.7	24.7
increase		1.5	3.0	3.1	4.1	8.0

table 1

The rate of growth outstrips most countries of the world, and it is estimated Uganda will, by the year 2050, be the sixth most populous country in Sub-Saharan Africa and the 20th in the world. The estimates are that the population will be 53.4 million in about 20 years and 101 million in 2050 at the current growth rate.[11]

About 80% of the population lives in rural areas, largely consisting of smallholder subsistence farmers but who contribute more than 70% of Uganda's wealth.[12]

[11] The State of the World Population Report 2003, UNESCO
[12] Uganda Bureau of Statistics

2.3 ENERGY AND ELECTRICITY POWER SUPPLIES[13]

The hydroelectric power potential of Uganda is high and estimated at over 2,000 MW, mainly along the River Nile. Current exploitation is about 317 MW. Private companies are in various stages of setting up large power plants. Their combined capacities will be 450 MW when completed.

Uganda's electrification rate is very low, with grid access of only 5% for the whole country and less than 2% in rural areas. This means that only 200,000 customers are connected to the grid with an annual growth rate estimated between 5.5 and 7.5%. Another 1% of the population provides itself with electricity using diesel and petrol gensets (portable generators), car batteries and solar photovoltaic (PV) systems. Electricity is consumed in the following proportions by sectors: residential (55%), commercial (24%), industrial (20%), street lighting (1%).

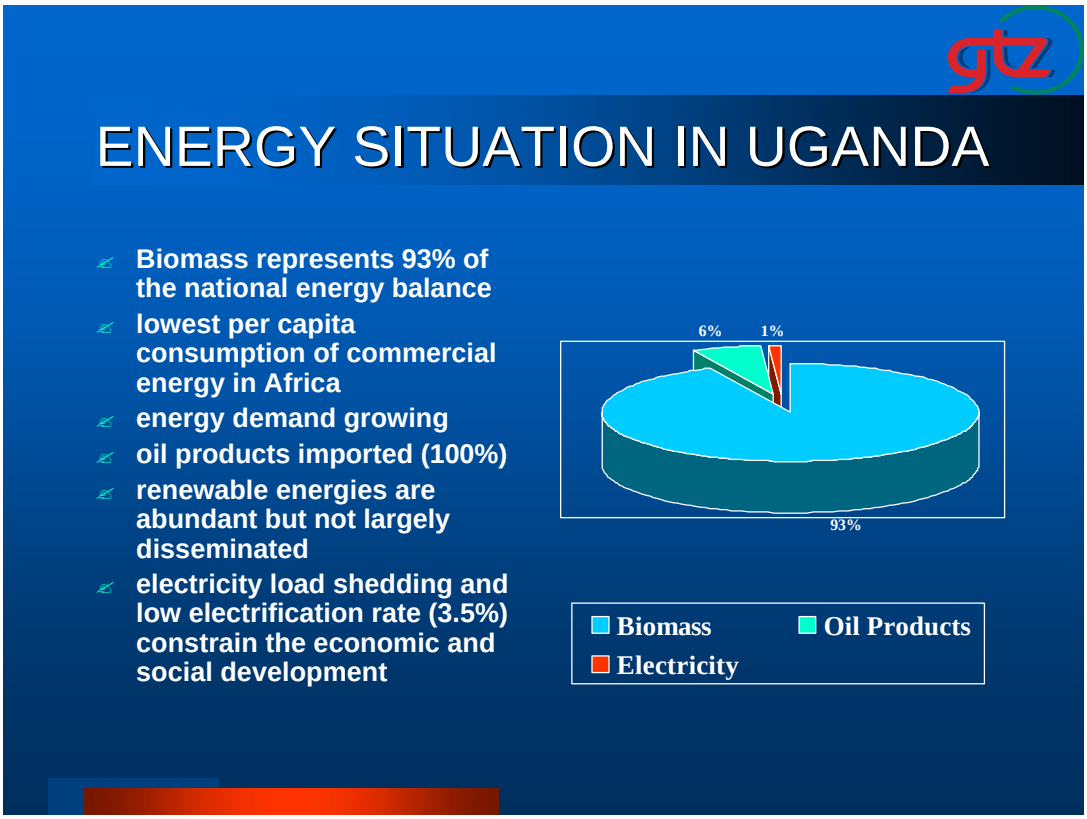
Recognising the need and importance of accelerating access to rural areas, a new Rural Electrification Strategy and Plan was adopted by Cabinet in February 2001 (MoEMD 2001), which states:

"Going by the definition of energy poverty as "the absence of sufficient choice in accessing adequate, affordable, reliable, quality, safe, and environmentally benign energy services to support economic and human development", it is apparent that there exists energy poverty at all levels in Uganda, particularly at household level in the rural areas. Evidence of this energy poverty can be found in the low levels of consumption of modern energy forms (electricity and petroleum products), the inadequacy and poor quality of electricity services and the dominant reliance on woodfuel sources. Yet, all modern economies are energy dependent. This means that if economic prosperity has to be achieved and sustained and living standards for the majority of Ugandans improved, a paradigm shift in policy and planning for energy supply and consumption is necessary. In the past energy planning has emphasised the addressing of supply side issues, especially for the commercial sources of energy, and not demand side issues. This approach has tended to favour the urban population, which is the major user of commercial fuels, while marginalising the energy needs of the majority of the population, which lives in rural areas and depends mainly on biomass. The rural areas also contain the largest proportion of the poor population. Therefore, recognising the role the energy supply improvement in the rural areas is likely to play in poverty eradication, it is necessary that energy for rural areas be brought into the realm of national energy planning.

"Uganda is richly endowed with a variety of renewable energy resources which include plentiful woody and non-woody biomass, solar, wind, geothermal and hydrological resources. Presently, with the exception of biomass, only a meagre fraction of the country's renewable energy potential is exploited. It is estimated that other renewable sources of energy, excluding large hydropower, contribute less than 2% of Uganda's total energy consumption."

[13] Source MoEMD 2002

The relative sources of energy are illustrated in the display below:



extract from Simonis 2002

Biomass (firewood, charcoal, and crop residues) plays a very significant role in Uganda's energy supply. It constitutes over 90% of total energy consumption in the country, as illustrated above. Fuelwood requirements have contributed to the degradation of forests as wood reserves are depleted at a rapid rate in many regions. Charcoal consumption increases at a rate close to that of the urban population (6% per annum).

Most of the traditional energy technologies (wood and charcoal stoves and kilns) currently used in Uganda are inefficient. The example[14] in Box 1(below) is an attempt to address this issue.

[14] reference MoEMD/GTZ 2003

Box 1 **Joint Initiative on Energy Conservation**

The energy policy recognises linkages between the energy sector and the other sectors. In particular, policies on the economy, environment, water resources, agriculture, forestry, industry, health, transport, education, decentralisation and land use have to be taken into consideration. For example, the policy says that renewable energy and energy efficiency should be included in the curricula of schools, polytechnics, vocatio

Two ministries, the Ministry of Energy and Mineral Development and The Ministry of Education and Sports, have cooperated in a school curriculum enrichment project "Energy is Life". Primary and Secondary materials have been prepared identifying the energy issues in the existing curriculum and providing illustrations using local examples. This project is part of the Energy Advisory Project and has been launched in all schools in one of Uganda's 56 districts, prior to being extended countrywide.

2.4 EDUCATION ISSUES

Basic National Statistics[15]

Functional Literacy

	1999/2000 %			2002/2003 %		
	male	female	total	male	female	total
6-12	30	30	30	59	63	61
10+	74	57	65	80	68	74
18+	77	51	63	82	64	73

Educational level reached at completion

	rural %			urban %			total %		
	male	female	total	male	female	total	male	female	total
none	28	34	31	20	22	21	25	29	27
primary	60	59	69	53	56	54	58	58	58
post-primary	12	7	9	26	22	24	17	13	15

There are 2244 secondary and 12773 primary schools registered with MoES, of which 65% are wholly government funded and 35% are private, religious or community schools.

The Functional Adult Literacy Programme (FALP) enrolled 149,019 in 2001

[15] Uganda Bureau of Statistics

2.5 THE MAIN EDUCATION ISSUES IN UGANDA,

with particular focus on how they relate to poverty reduction targets like the MDGs.

"The main education issue in Uganda is quality"[16]

A detailed expansion of this follows in the description of the Review of the PEAP, which, while addressing the full range of poverty issues across all sectors, spent a large proportion of its proceedings on issues related to education. It has already been emphasised that the PEAP has salience in addressing policy priorities in all parts of government. Therefore, the deliberations of the recent PEAP Review are highly relevant.

2.5.1 Poverty Eradication Action Plan (PEAP) Review
Stakeholder conference 28th-30th October 2003 Kampala, Uganda

4 major challenges for poverty reduction in Uganda were outlined by the vice president Prof Gilbert Bukenya in his opening statement[17] :

1. agriculture (constraints such as limited access to technology, information and financial services, marketing, transport infrastructure, land distribution)
2. insecurity in the north and east of Uganda (it is central to end the conflict)
3. human development (there has been progress in combating AIDS epidemic, but other health issues have not been improving eg. infant mortality; primary education is provided for a hugely increased number of children, but drop out and quality remain concerns; the rate of population growth is one of the highest in the world)
4. transparency and integrity of government (including ensuring that ordinary citizens have the info they need to monitor the delivery of public services at the local level)

The Ministry of Education and Sports (MOES) presented its sector PEAP revision paper which highlighted the fact that the education sector has been targeted as a priority area exemplified by the high allocation to education expenditure in general and primary education in particular and ' has mainly targeted poverty related areas i.e. construction of classrooms, provision of instructional materials, construction of teachers houses, provision of desks'

In discussion it was pointed out that the MOES paper is a public sector plan rather than a whole sector plan. There is a need to strengthen the public/private partnership in the delivery of educational services. See box 2: costs and quality

The MOES stated that 'whereas progress has been registered in the other sub sectors of the education sector, a lot of emphasis has been placed on primary education and those sub sectors that provide service to it i.e. primary teacher education. In the revised PEAP , a balance must be struck between primary education and other sub sectors that support poverty without compromising the gain already registered in the area of primary education.'

[16] Personal communication, Richard Akankwasa, Director of Education, MoES
[17] Bukenya 2003

The prolonged insurgency in the north of Uganda (17 years) has had gross negative effects on the education sector. Fear of attack has caused high dropout rates, high pupil/teacher ratio, poor school inspection, monitoring and supervision of the teaching and learning process. Displaced children have caused great pressure on the host districts.

Box 2

Costs and quality

In a discussion on costs and quality it is important to consider how much can be afforded by Uganda to educate its children.

The current Education Sector Six Monthly Report (May – September 2003) (MoES 2003c) states that 31% of the national budget is committed to education expenditure, and of that, 66.5% is on primary education – an impressive demonstration of the priority given to primary education.

The pupil numbers for the period are 6,835,525 and the budget allocated was 336.181 billion Ugandan Shillings. This amounts to 49,181 Shillings per child for the year. This is approximately UK£14.90 per child.

The UK journal 'Education Weekly' of 31 October 2003 quotes DFES as allocating an *increase* of £140 per pupil to support children in English Schools last year (Hubbard B 2003). This was some 4% of gross expenditure in schools. Small wonder there is an issue of quality of service to Ugandan children. It also highlights how relatively expensive it is for them to maintain IT equipment or an electricity supply even if the capital costs are met elsewhere.

Some current statistics and information provided by the MOES follow:[18]

Pre-primary

Only 8% of children from poor households attend pre-primary education
There is a general lack of awareness of the importance of early childhood development (ECD). Many underage children attend rural primary schools due to lack of alternative provision.

[18] MoES 2003d

Primary

Headline statistics include:

- Of the original cohort enrolling at the beginning of the UPE policy in 1997 only 22% of children completed their primary schooling.
- girls' enrolment is at almost 50% of total
- pupil/teacher ratio is now 54:1
- many primary schools lack proper sanitation and water and only 50% of schools have access to safe water

There is ongoing improvement in input ratios, but quality issues must be addressed such as:

- the development and monitoring of basic competencies per grade.
- improvement of the intellectual access to basic education and learners' retention in the schooling system
- ensuring relevance of curricula by making provision for adaptation to changing and regional living conditions as well as labour market needs and opportunities
- the assessment and examination system will continuously be adjusted in order to match changing needs, and to relate to the realities of Ugandan society.

There is a slow rate of recruiting teachers and failure to attract teachers to some districts which are rural, isolated or insecure.

Government is emphasising inclusive education in all primary schools but there are no proper facilities for children who are blind, deaf, or physically handicapped, and few specialist teachers. There is a new policy for educationally disadvantaged children, but most schools lack teachers for special needs education (SNE), counselling and guidance. Children with disabilities normally drop out due to the unfriendly environment.

There is a continuing shortage of classrooms, textbooks, pupils books and instructional materials.

The high drop out rate (particularly of girls) is attributed to:

- lack of provision of mid day meals,
- parents' inability to provide basic requirements like pencils, books, uniform etc
- insufficient sanitation provision
- competing priorities

Government aims to build 6000 classrooms per year in the next 5 yrs.

Post-primary

Despite the high drop-out, the number expected to transfer to secondary school is very high. The available post primary provision can absorb only 50% of expected primary leavers.

Post primary education options are oriented towards secondary schools with the minority of vocational schools being unpopular with parents and regarded as ill equipped and not providing access to 'good jobs'.

748,874 pupils are currently studying in secondary schools. The majority of provision is in private schools. Consequently, many children cannot attend secondary school due to high direct costs or the unavailability of a school in their locality.

The Uganda household survey suggests that 60% of household incomes are below Ug Shs. 100,000 (US $ 50) per month. 5-10% of this income is allocated to education (with an average family size of 4-5). This means that participation in secondary is expected to decrease as the capacity to pay direct costs of schooling is rapidly declining.

In anticipation of the rapid expansion in demand for secondary provision, the ministry has put in place the following measures:

- grant aid 176 private community sec schools in sub-counties without any school
- construct 60 'seed' schools in sub-counties lacking private community secondary schools
- upgrade existing facilities in rural schools
- expand facilities in rural schools thru laboratory and library construction especially in girls' schools
- provide a bursary scheme for needy bright students

Government has made an effort to construct laboratories to improve the teaching of science, maths and technology. There are 271 Government aided secondary schools with laboratories. 480 government sec schools still do not have laboratories.

The vocational sector, providing business, technical, vocational education and training (BTVET), has been unsuccessful and unpopular in the past. To address this, a BTVET reform strategy, which encompasses planned measures to ensure that services are relevant and accessible to the poor, has been initiated. These proposals to increase investment in this part of post primary provision is an opportunity to demonstrate the appropriateness, cost effectiveness and other advantages of ICT.

The balance between public and private investment in this sector is part of the debate, but the PEAP Review heard that 'Arguments for public intervention in the BTVET sub sector are based on the role it plays in empowering individuals through provision

of employable skills for self sustenance, and for the benefit of the economy both in the formal and informal sectors.'

There are 144 public institutions and about 600 private training providers and a number of apprenticeship and enterprise based training programmes. The paper (*op cit*) provides a long list of issues which must be addressed in order to make BTVET work well, as the sector has been neglected and run down in favour of 'conventional' secondary school education.

Higher education

Uganda must create a cohort of highly educated people to manage the emerging economy which will contribute to poverty alleviation by increasing wealth, paying taxes and using their skills to the benefit of the community.

There are 16 licensed universities, and more than 40 other tertiary institutions. A newly established Higher Education Commission is embarking on the task of assessing standards and promoting quality in the sector.

It is a concern that, of 75,000 students, only 15% are following science and technology courses. 80% are taking arts and humanities courses.

2.6 DECENTRALISATION

The policy of decentralising government to local governments is a response to the negative effects of the highly centralised regimes prior to 1986. Uganda has taken the most radical of the options in delegating the maximum of responsibility through the hierarchy of democratic local councils. This has brought many new challenges where the pursuit of efficient government vies with the effects of greater democratic involvement (Nsibambi 1998)

In practice there is now a responsibility for central ministries to guide and support local governments in adapting to new paradigms and processes, which makes all innovation extremely hard work. Issues such as of learning to use new alliances and collaborations at the centre have to be rehearsed in the 56 districts for there to be effective implementation at the local level. In particular, the policies of education are implemented by local governments with little experience of education development. The PEAP Review discussions emphasised the necessity of building strong systems and communication to counteract corruption. There are many opportunities for ICT applications to significantly contribute to this goal.

3. Energy for Rural Transformation (ERT)[19]

[19] source MoEMR www.energyandminerals.go.ug

This World Bank project is in the first phase (four years) of a ten-year programme. The project will accelerate rural access to electricity and ICTs – not as an end in itself but to help achieve rural transformation – which means significant improvement in the productivity of rural enterprises and in the quality of life and services in rural areas. Building on lessons from past experience and successes in a number of sectors, this project embodies four basic concepts:

1. **Selective cross-sectoral linkages** -working with key potential rural users of electricity: first with ICTs, which themselves need electricity, and second, electricity and ICTs together with SMEs, health, education, agriculture, and water. This spreads the benefits of electrification even to those who are not directly connected. Further the linkages will exploit synergies in service provision and development impact without requiring extensive coordination or letting problems in any one sector hold up other sectors.
2. **Public Private Partnerships:** support can include partial risk-sharing with commercial financiers, assistance with the introduction of low-cost designs, and working with communities so that they accept and support private provision.
3. **? "Smart" subsidies**: Carefully designed subsidies are needed to take account of affordability and to attract the private sector as well as commercial finance.
4. ? **Renewable energy resources:** sunshine, biomass, small hydro, wind, etc. – are often widely available in remote rural areas. Their utilization, supported by "carbon finance" from GEF, PCF and donors, can cost- effectively contribute to rural transformation, while providing environmental benefits.

MOES RESPONSE TO ERT

The Ministry of Energy and Mineral Resources (MoEMR) has enlisted the support of other ministries, including the MoES, to implement ERT. The 'Final Project Implementation Plan'[20] outlines the MoES response. The Plan reviews existing policies and priorities, and proposes that the ERT support post primary education in ten localities with a range of activities. It identifies links with the Education Sector Investment Plan (ESIP).

The ESIP was designed to cover the years 1998 to 2003 and so has completed that phase. ESIP 2 will cover the next five year period and work has begun on its compilation. It will be essential for the ERT education component that its expenditure needs are anticipated in this plan.

Insofar as this study is looking for opportunities to explore the link between access to energy and MDGs, the education proposals, which apply only to the post primary phase, miss the MDG UPE target. There will, however, be opportunities to look at teacher retention, improved access to utilities for students and staff and the influence of ICT on teachers' performance and retention.

[20] Education Planning Department 2002b

However, the overall ERT programme which will affect many rural disadvantaged communities, does offer an opportunity for investigation of the primary education MDG and access to energy.

4. Other relevant policies

4.1 RURAL ELECTRIFICATION STRATEGY AND PLAN (2001 – 2010)[21]

The Rural Electrification Strategy is led by the Ministry of Energy and Mineral Development (MoEMD). They published an Energy Policy for Uganda in September 2002 within which was the commitment to implement the Rural Electrification Strategy and Plan (2001 - 2010)

This Strategy is key to the ERT, and aims to achieve a rural electrification rate of 10% - increasing the present 80,000 customers to 480,000. It intends to exploit all means of electricity production to the benefit of all sections of rural society, using private and public providers.

4.2 RURAL COMMUNICATIONS DEVELOPMENT POLICY

This policy is the responsibility of the Uganda Communication Commission, the telecommunications regulator for Uganda. The Mission of the Policy is "to support the development of communications infrastructure in rural Uganda and ensure people in all areas have reasonable and affordable access to communications services"

It has the powers to support access to communication facilities to areas recognised as uneconomic by commercial criteria, under the ICT component of the ERT, and will '…finance…facilities… in regions not viable for commercial operation'.

All of the above adds up to a complex pattern of relationships, hierarchies and policies which is a challenge to the most committed of public servants.
Ministry officials generally have a sound understanding of the overall picture and their place in the network. However, there is no evidence of anyone bringing the threads together to create an efficient strategy. Sometimes progress is therefore slow (see Box 3)

[21] MoEMD 2001

Box 3

Energy for Rural Transformation - Interdependence

In December 2001 the World Bank announced a $61million project 'to develop Uganda's rural energy and ICT sectors'.

The parent ministry for the implementation of the project is the Ministry of Energy and Mineral resources (MoEMR), who will coordinate the cross-sectoral links to accomplish the task. Support of other ministries has been enlisted and in May 2002 the Ministry for Education and Sports (MoES) prepared its ERT Final Project Implementation Plan.

In parallel with this initiative, the Ministry for Works, Housing and Communications (MoWHC), together with the President's Office and the National Council for Science and Technology (NCST) published a draft National ICT Policy in July 2002. This policy is still under discussion, indeed there is yet to be agreement on the scope of the policy, the definition of ICT, or the location of responsibility for implementation (currently assigned to MoWHC).

Meanwhile, MoES which prepared its own draft Policy on ICT for the Education Sector published in May 2002, in December of that year published terms of reference for a Baseline Survey/Needs Assessment of ICT in the Education Sector - a very necessary preliminary before implementing a policy or allocating resources from any source or through the ERT project.

Unfortunately MoES funds are not available to pay for the Survey.

So, by November 2002, the progress of the ERT implementation is hampered by the

5. Notes on individual projects

Uganda boasts a wide range of ICT educational activity focusing on the pupil in the school. These are summarised below:

5.1 I-NETWORK

I-Network is an association of individuals and organisations promoting a "knowledge and information sharing community" through ICT. It operates in new premises with two computer suites at Kyambogo University and is funded by the International Institute for Communication and Development (IICD).

IICD held a roundtable workshop in 2000 on the Theme, "The Role of ICT in Education in Uganda". One outcome was the 'Production of ICT Based Education Content' project (PIBEC). This project aims to address the scarcity of educational

material generally by developing and producing ICT based education content or teaching material at a lower cost than traditional materials

5.2 SCHOOLNET

Funded by the Gates Foundation
www.schoolnetuganda.sc.ug

SchoolNet has now established an effective network of 22 schools with connectivity to the internet through Very Small Aperture Terminal (VSAT) links.
The Project was a Stockholm Challenge finalist in 2002.

5.3 CONNECT- ED[22]

(www.connected.ac.ug)

The overall task was to integrate computers into the teaching methods of Primary Teacher College (PTC) faculty and build capacity among staff by establishing computer-assisted teacher training laboratories and resource centres. The goals to achieve this included:

- Establish a multimedia development lab at Institute of Teacher Education Kyambogo (ITEK) in Kampala.
- Establish a training-user lab at ITEK.
- Create a series of multimedia materials tied to ITEK 's teacher curriculum.
- Create a team of ITEK staff that will have the capacity to continue multimedia materials development as the project ends.
- Refurbish and outfit computer labs in eight Primary Teacher Colleges.
- Provide Internet connectivity at all the sites with a minimum of 64 kpbs for each lab with e-mail access for the local business communities in rural areas
- Develop and disseminate a course on computer literacy.
- Train PTC tutors to become counterparts to the staff in the labs and to take over at the end of the project.

Plans to "sustain" the PTC labs by opening up services to the community are very vague and problematic. PTCs are allowed to charge fees for services for people other than students. They can generate income as long as they write a project proposal, including a business plan, for the MOES to approve. Most PTCs are far from any population centre and will have problems attracting outside users. The income level of the surrounding communities is far lower than in Kampala. There is little activity in assessing the potential for customers or partners. Demand within the PTCs for lab resources is already overwhelming. Total Cost of Ownership was not considered or made explicit by the planners or contractors. PTC principals must be involved in any strategic planning to add sources of income to the MOES budget allocation for their PTC.

[22] anon 2003 This extract is from an internal evaluation of the activities

- Having access to the world of information on the Internet and acquiring technology skills made a strong, positive impact on all participants.

- PTC principals need to analyse the electricity and others costs estimating the Total Cost of Ownership (TCO) for running the labs.

- The issue is not either books or computers. It is about providing appropriate resources for different learning environments which range from these well-equipped PTCs to remote primary schools without electricity.

- Design and implement a study to follow-up with PTC students after they have become practicing teachers.

5.4 CURRICULUMNET

This project was established[23] in partnership with the National Curriculum Development Centre of Uganda in 1991. At the same time, the World Bank had spent the last two years attempting to bring ICTs into selected schools in Kampala through its WorldLinks Project. Computer clubs and laboratories were created but few teachers were trained and the majority were unaware of ICT development in their own school. The CurriculumNet project was consequently created to bring ICTs into teaching and learning for all schools at both primary and secondary levels of education.

Six pilot projects (3 secondary and 3 primary) and 4 subjects were selected after a baseline survey of the education sector. 2 primary subjects (Social studies and Mathematics) and 2 secondary subjects (Geography and Mathematics) were chosen as guinea pigs. The content of the curricula for the selected subjects were to be written by subject specialists to infuse them with ICT resources, enhancements and sources for teaching and learning. In order for this to happen, ICT training was given for 3 weeks between July and August 2001 to a total of 39 primary stakeholders including the 2 project full-time staff, teachers from participating schools and curriculum experts for the chosen subjects. The 2 project staff members received further training exposure at the Memorial University, Newfoundland, Canada in September/October 2001.

After the training workshops, the curriculum specialists commenced the task of developing the content for the 4 subjects. By February 2002, the content for the primary schools had been completed while work was still continuing with the development of the content for the 2 secondary subjects. Content development took longer than anticipated.

14 computers are available in the National Curriculum Development Centre Lab. One of the 14 PCs is a server for the Internet, intranet and LAN.

[23] CurriculumNet 2000

5.5 UCONNECT SCHOOLS PROJECT

(www.uconnect.org)

This project, with partners in USA, Switzerland and UK, is an NGO providing a range of ICT services for schools. They have established links with hardware suppliers internet service providers (ISPs) and software developers to provide a unique service. The school purchases the equipment and materials for local internet connectivity and a networked computer lab. The organisation then trains the local staff to install and maintain the system. The software used is 'open source' which is generally free. Although subsidised at this stage, the project has many characteristics of sustainability in the longer term.

6. Measurement of the impact of energy services on educational attainment

The monitoring data which is collected to assess progress in UPE is quantitative information on the following:

pupil teacher ratios by administrative district
pupil text book ratio for key texts by district and by year group
pupil classroom ratio by district

These represent key factors in measuring progress in the policy of universal primary education, recognising the impact of a substantial increase in pupil enrolment following the introduction of the UPE policy in 1996

There is a commitment in the next year to report on the following:

balance between boys and girls in P7 (the final primary year) by district
net enrolment ratios – expressing the proportion of the age cohort who attend school in each district
primary completion rates
proportion of pupils reaching defined levels in literacy and English
proportion of pupils reaching defined levels in numeracy

By that time, the first cohort of UPE admissions will have reached the secondary transfer stage

At secondary level, the data collected nationally comprises the performance by pupils in the 'O' and 'A' level examinations

We have found no evidence of the use of any methodology to measure directly the impact of energy services on educational attainment. However, there is plenty of evidence that people want their education provision to be relevant to their lives. It follows that the education 'menu' must be improved to provide real learning about

energy through experiential learning, access to ICT, good pedagogy etc. Measures of success would follow. This is an enormous challenge in the present resource climate, and can only be attempted through high levels of collaboration between sectors and between stakeholders at national and local level.

The greater involvement by the MOES in the ERT programme gives an opportunity for an evaluation of the impact of the available energy on educational outcomes.

Methods currently used in education to determine increases in educational attainment that are not linked to energy but support poverty reduction strategies.

Currently only quantitative outcomes are measured in the UPE programme. Secondary education provides for the poverty reduction of the individual (high academic grades which allow entry to higher education). The BTVET programme, however, supported by GTZ and JICA, in response to general demand for qualifications which relate to the needs of 'the forgotten majority', is developing a national framework of qualifications which relate to 'non-academic' achievement (UVQF - Uganda Vocational Qualifications Framework). This should reflect poverty-reducing educational attainment.

What educational benefits could be derived from energy and ICTs?

The current curriculum menu, which is under review, is essentially academically oriented and is seen as less than relevant for the majority by many commentators and parents[24]. A typical view from the farming population is that primary education should 'provide a basis for transferring (transforming?) this rural community' and that government should provide 'extension services' (adult education in the form of advice and training for farmers in adapting to change) UPPAP case study: Bushenyi District Report[25] ; community proposals for government assistance p.105.

The shortcomings of the present curriculum will, hopefully, be improved by the current review process. ICTs have potential to enrich the existing material in the curriculum by easier access to information. A group of 18-22 year old students in a rural secondary school feel that energy is important to their educational attainment, but quality of teaching is more so. They made little mention of ICTs, probably because they have no experience of ICT use, and their secondary school experience is dominated by academic requirements[26].

Teacher retention rates in rural schools, in Uganda are said to be improved by energy provision through ICTs, electricity or other forms of energy.

Informal evidence from the Connect Ed project which is yet to submit a formal evaluation suggests that primary teacher education is more effectively delivered when

[24] Rigby 2003
[25] Centre for Basic Research 2003b
[26] Students' Essays 2003

assisted by the medium of ICT. However, the SchoolNet experience which functions with teachers in schools has found that teacher coordinators are being 'lost' into commerce and other non-education activity on the basis of their newly acquired ICT skills (teachers' pay is very low).

Other energy-dependent benefits such as refrigeration, safe water, lighting etc. are seen as positively affecting teacher retention in rural areas.

The benefits of energy and ICT to rural populations

Rural populations are almost totally dependent on local natural resources. Most energy needs are met by the rapidly declining trees and bushes and other biomass - see UPPAP ll[27] . The Report states (p 92) "…different households also engage in a wide range of environment-based economic activities, including: firewood collection/gathering and selling, brick making, charcoal production". Ironically one study found that the degradation of the environment was less the responsibility of the poorest and more of the 'relatively rich' e.g. "The demands made on the forests by the poor were not a match to that of the relatively rich who had more wives and children and therefore higher demands for forest products, especially firewood"[28]

The Uganda Poverty Status Report finds that "The quality of the environment and natural resources on which poor people depend is declining resulting in reduced incomes"[29], and biomass supplies the majority of their energy needs (Simonis 2002).

Extrapolating from the PEAP multi-sectoral presentations and the Bushenyi report[30], people desperately need accessible information advice and training in:

- conserving and regenerating local biomass
- ways of using less energy (eg different cooking methods; access to safe water which does not need boiling)
- finding appropriate alternative energy and income sources

For adult learners, ICT availability and accessibility has potential, in the right context, to contribute to rural learning.

Cross-sectoral benefits from ICT deployment in schools

There is great potential here. Most of the PEAP issues are cross-cutting (eg. health issues such as HIV/AIDS, agriculture, lack of information, isolation, conflict, energy, education, environmental conservation, empowerment of local people, corruption, water). It is, therefore, crucial to build synergy between sectors, and some sectors are trying to do this. It is also clearly necessary to build communication at grassroots level and between grassroots and regional and national level.

ICT is a tool which has the potential to contribute significantly to both these aims.

[27] MoFPED 2003
[28] Centre for Basic Research 2003b
[29] ibid
[30] Centre for Basic Research 2003a

One feasible way to address so many urgent needs for information and communication would be strategically-planned centres for the use of ICT and telephone, as well as, ideally, libraries, and advice on health, farming, nutrition, early childhood development, energy, water etc. These centres, perhaps on the lines of the ACACIA Project[31], could be satellites of learning and communication for the rural people, cascading information outwards in time-honoured style.

Many organisations are desperately trying to (or plan to) set up centres for one reason or another, but we have seen no evidence of coordination. Unfortunately, there is some evidence of centres set up without good consultation with dismal results.

In the foreseeable future, most schools cannot afford to run ICT on their own. To use ICT, they must collaborate with other sectors. Some schools could be enhanced and developed as centres themselves, or link with their nearest centre.

It is collaboration, however, which seems to be a major sticking point.

7. Conclusions

The conclusions we draw from this review of literature and activities are:

1. The link between energy and the kind of educational attainment which will reduce poverty in Uganda is very strong. If poor people understood more about the issues, then they would have more control over their lives which is a major factor in overcoming poverty.

2. The concepts of 'poverty', 'educational attainment' and 'energy' are not always clear in the Ugandan context. The connections between access to energy, educational achievement and poverty will be difficult to assess and quantify because of the problems of definition, and the large number of factors to be taken into consideration.

3. The Energy for Rural Transformation (ERT) project provides an opportunity for research into links between access to energy and educational achievement, but the Education component does not envisage projects in primary schools.

4. Many of the reasons for primary drop-out are energy related (eg. poor sanitation, lack of safe water, poor meals provision, poor teacher morale, lack of relevance in the curriculum to the mostly energy-related needs of rural life).

5. ICT in support of learning seems to be a strong motivating factor for both pupils and teachers.

[31] Etta 2003

6. There is no sectoral or national ICT policy in place, although discussions to develop policies have been proceeding for some years. It is no surprise, therefore, that we find conclusion 7 (below).

7. The existing projects in schools cover wide areas of educational activity with no evidence of strategic coordination.

8. Recommendations for the way forward

8.1 POLICY

1. GoU should be urged to conclude the process of development of a National ICT Policy and the Policy for the Education Sector.

2. Preparation of ESIP ll provides an opportunity to improve the incorporation of ERT into education activity. In particular Recommendation 3 (below).

3. The existing policy of improving teachers' houses, sanitation and water provision for primary schools should be linked with the ERT education component.

4. The review of school curricula must prioritise improving the relevance of the learning experience from the point of view of rural communities (80% of the population).

5. As the cost of acquiring and running conventional ICT is prohibitive, more cost effective ICT options should be explored. It is crucially important to optimise the use of scarce resources. Therefore, the identification and promotion of potentially successful collaborations is strongly recommended.

8.2 RESEARCH ACTIVITY

6. The evaluation of the ERT Project should be adapted to include a study on the performance of primary schools in communities benefiting from the Project. The experience and skills of the Education Standards Agency (ESA) and the Uganda Participative Poverty Assessment Programme (UPPAP) should be brought together to accomplish this.

7. There should be a review of the evaluations of the four existing education based projects (Connect-ED, CurriculumNet, SchoolNet and U-Connect) with a view to identifying potential for collaboration and coordination.

8. A comparative study should be undertaken which examines pupil and teacher motivation and performance in a group of schools and teacher training colleges within the above projects with a matched set of establishments outside of these initiatives.

Organisations who should be consulted are

Makerere Institute for Social Research (MISR)
Kyambogo University,
Ministry of Finance Poverty Unit (UPPAP),
Ministry of Energy and Mineral Resources
National Curriculum Development Centre (NCDC),
The Ministry of Education and Sports
The Education Funding Agencies Group.
Education Standards Agency (ESA)

Appendix 1 List of acronyms

ABEK	-	Alternative Basic Education for Karamoja
BTVET	-	Business, Technical, Vocational, Education and Training
DFID	-	Department for International Development
COPE	-	Complementary Opportunity for Primary Education
DANIDA	-	Danish International Development Agency
DEO	-	District Education Officer
DFID	-	Department for International Development
DIS	-	District Inspector of Schools
EMIS	-	Educational Management and Information System
ERT	-	Energy for Rural Transformation
ESA	-	Education Standards Agency
ESIP	-	Education Strategic Investment Plan
GoU	-	Government of Uganda
GTZ	-	Deutsche Gesellschaft fur Technische Zusammenarbeit
HIPC	-	Heavily Indebted Poor Countries
ITEK	-	Institute of Teacher Education Kyambogo
ICT	-	Information and Communication Technology
JICA	-	Japanese International Co-operation Agency
KCC	-	Kampala City Council
MoEMD	-	Ministry of Energy and Mineral Development
MoES	-	Ministry of Education and Sports
MoFPED	-	Ministry of Finance, Planning and Economic Development
MoPS	-	Ministry of Public Service
MTBF	-	Medium Term Budget Framework
NAPE	-	National Assessment of Educational Progress
NCDC	-	National Curriculum Development Centre
NCHE	-	National Council for Higher Education
NORAD	-	Norwegian Agency for Development
PLE	-	Primary Leaving Examination
PTA	-	Parents'/Teachers' Association
PTC	-	Primary Teachers College
PTR	-	Pupil – Teacher Ratio
SFC	-	School Facilities Grant
SMC	-	School Management Committee
SNE	-	Special Needs Education
TDMP	-	Teacher Development Management Plan
TDMS	-	Teacher Development Management System
TVET	-	Technical Vocational Education Training
UNEB	-	Uganda National Examinations Board
UPE	-	Universal Primary Education
UPK	-	Uganda Polytechnic Kyambogo
USAID	-	United States Agency for International Development
UVQF	-	Uganda Vocational Qualifications Framework
VSAT	-	Very Small Aperture Terminal

WB - World Bank

Appendix 2: list of documents

author	initial	date	title	publisher
anon		2003	Connectivity for Educator Development Final Report	ConnectED
Centre for Basic Research		2003a	Poverty and Environment Case Study: Moroto District Report	MoFPED
Centre for Basic Research		2003b	Poverty and Environment Case Study: Bushenyi District Report	MoFPED
Centre for Basic Research		2003c	Poverty and Environment Case Study: Kampala District Report	MoFPED
Centre for Basic Research		2003d	Policy and Advocacy Messages: Moroto, Bushenyi and Kampala Districts	MoFPED
Connect-Ed		2002	Training Teachers with Technology	Connect-Ed
CurriculumNet		2000	Integration of Educational Technology into Curriculum for Primary and Secondary Schools in Uganda, a Pilot Project Proposal submitted to IDRC	NCDC
DFID		2002	Energy for the Poor	DFID
DFID		2003	Energy for the Poor	DFID
Education Planning Department		2002a	Terms of Reference for A Consultancy to Undertake Baseline Survey/Needs Assessment of ICT in the Education Sector	MOES
Education Planning Department		2002b	Energy for Rural Transformation Project: Education Component. Final Project Implementation Plan	MoES
Etta F. et al		2002	ACACIA Elas Report of the Pan Africa Telecentre Study Uganda (DRAFT)	MISR
GoU		1992	White Paper on Education	GoU
Hubbard B (Ed)		2003	Education Weekly 31 October 2003	EPW Ltd
IICD		2003	I-Network Uganda (publicity leaflet)	IICD
Kakembo-Ntambi	Ignatius	2003	Development of Strategies and Action Plans for Implementation of the National ICT Policy for Uganda: Workshop presentation	UNCST
Meadows	Kate	2003	Energy, Poverty and Education, A Review	
MoEMD		2001	Rural Electrification Strategy and Plan Covering the Period 2001 to 2010	MoEMD
MoEMD		2002	The Energy Policy for Uganda	MoEMD
MoEMD/GTZ		2003	Energy is Life, A project to Promote Energy Conservation Education and Practices in Ugandan Schools	GoU
MoES		2002	ERT- Education component. Final Project Implementation Plan	GoU
MOES		2003a	Policy for Information and Communication Technology in the Education Sector (draft)	GoU

MoES		2003b	Energy for Rural Transformation Project: Education Component. Workshop presentation	MoES
MoES		2003c	Education Sector Sixth Monthly Report May - November 2003	MoES
MoES		2003d	Sector PEAP Revision Paper	MoES
MoFPED		2003	Uganda Poverty Status Report, 2003	GoU
MoWHC		2002	National Information and Communnication Technology Policy (draft)	GoU
Mulira Dr	Ham-Mukasa	2003	Comments on National ICT Policy	internal communication
NCDC		1999	Uganda Primary School Curriculum	NCDC
NCDC		2003	Curriculum Net Project (publicity leaflet)	NCDC
Nsibambi A (Ed)	Apolo	1998	Decentralisation and Civil Society in Uganda	Fountain
Olupot M		2003	Newspaper Report (10 October 2003)	New Vision - Kampala
Parliamentrary Office of Science and Technology (UK)		2002	Access to Energy in Developing Countries	POST
Rigby, S & Rigby W		2003	Counting the Cost	unpublished research for ActionAid(Uk)
Simonis P		2002	The Energy Policy of Uganda: Powerpoint Presentation	GTZ
Students' essays		2003	Ndejje High School	unpublished
Uganda Debt Network		2003	Policy Review Newsletter	Uganda Debt Network
UNCST		2003	Guidelines for the Strategy to Inplement the National ICT Policy for Uganda	MoFPED
UNEB		2001	Uganda Certificate of Education Regulations and Syllabuses 2001-2005	UNEB
UPPAP		2002	Deepening the Understanding of Poverty	MFPED
UPPAP		2002	Why the Environment Matters to the Poor: Deepening the Understanding of Poverty (publicity leaflet)	MoFPED
World Bank		2003	World Development Report 2004:Making Services Work for Poor People	World Bank
Youth Forum		2003	World Telecom World 2003 Youth Forum Declaration	Submission to WSIS

Appendix 3: Map of Uganda

with acknowledgements to city.net

Appendix C2

Uganda Workshop Report

Bill Rigby

Voice International

Table of Contents

- Welcome and Introductions
- Workshop Objectives
- Study Background and Objectives
- Conclusions from the literature review
- Group discussions on Questionnaires
- Opportunities and Need
- Limitations and Barriers
- Conclusions from the workshop
- Recommendations
- List of participants

PEER REVIEW WORKSHOP ON HOW ACCESS TO ENERGY SERVICES IN COMMUNITY IN SCHOOLS IMPACTS ON EDUCATIONAL ATTAINMENT AT THE SCHOOL AND COMMUNITY LEVEL

HELD AT MAKERERE INSTITUTE OF SOCIAL RESEARCH

ON THURSDAY 26TH FEBRUARY 2004.

WELCOME AND INTRODUCTIONS

The participants were welcomed to the workshop by Mr. Asiimwe Delius, Senior Research Fellow, MISR. He gave a brief background of Makerere Institute of Social Research, as the oldest and the most reputable Social Research Institute of Makerere University. It is against this background that VOICE International decided to partner with MISR in this process of testing methodology to be used in the study on Energy, Education and Poverty nexus. Delius then called upon the participants to introduce themselves individually by giving their names and organisations (see list of participants).

WORKSHOP OBJECTIVES

Delius highlighted the objectives of the workshop and requested participants to feel free to participate and give inputs so that the team could produce a robust research methodology to be used in a larger study. The agenda of the workshop was:

- To present background on project
- To present rationale and approach
- To present context and tools used in Uganda
- To critically review national approach and tools
- To get some input from participants on wider issues of energy, education and poverty nexus

Thereafter, he called upon Alison Bannister of Future Energy Solutions and Bill Rigby of VOICE International to make their presentations on Background and conceptual framework of the study and summary of the Literature Review respectively.

STUDY BACKGROUND AND OBJECTIVES

Alison Bannister who presented the background of the DFID KaR Project said that the KaR project is based on the premise that although energy permeates many aspects of human activity, little research has been conducted to test the significance of the linkages between modern energy service provision and poverty reduction.

The goal of this study is to inform the design of policies and programmes across all development sectors as to how access to and use of modern forms of energy (gas and electricity) can reduce poverty. This might mean designing poverty interventions that take into account energy as an integral part rather than an add-on. It may also mean designing energy policies that are more pro-poor.

Phase 1 (activity 1) of the study included:

Activities

detailed literature review, discussion with donors and researchers interested in the study area, reviewing of the past and on-going projects to extrapolate on past methodologies and commissioned 'think pieces'

Outputs

There is little evidence of a quantitative nature and thus of proven methodologies. However there is a conceptual framework to work with and the hypothetical linkages. There are calls for more monitoring and evaluation and the importance of collaborative approaches.

The major issues in this phase are: How do energy and poverty inter link? What evidence is available in each of these areas. In comparison, in Health there is quite a lot of linkage between energy and health however, the causality/dose response remain an issue; in Environment the links to poverty is still an issue; in Gender much of the available data is qualitative. However, there is very little information on the linkages between education, energy and poverty nexus.

The immediate question are**:** What is energy? How do people use energy? What determines how they use energy which brings in the concept of the energy ladder. She explained the energy ladder that as people's income increases; they tend to move according to the Energy ladder. They move from using crop, dung, wood, charcoal, coal, gas to electricity.

On the other hand questions such as, What is poverty? How is it defined? How is it measured bring in the qualitative versus quantitative debate (see example in the table below).

Quantitative/qualitative evidence

Dimension	Quantitative	Qualitative
Information on population	Numerical	Non numerical
Population coverage	General	Specific
Involvement of the population	Passive/Researcher- Directed	Active Participation/Subject Driven

Inference methodology	Deductive relationship between theory and research	Inductive
Disciplinary framework	Economics/Science	Social Science

Next Steps

The conceptualisation of the project used Millennium Development Goals (MDGs) as mediating elements. It concluded that although evidence existed to support health and environmental linkages there was very little evidence for gender and education. This next step was to examine these linkages: gender-energy-poverty in South Africa and education-energy-poverty in Uganda.

The nexus was described as follows: if education reduces poverty and energy assists in educational attainment (i.e human capital), then energy reduces poverty.

Phase 1 (activities 2-5) – Methodology Development

Phase 1(1) recommended further study on education/energy/poverty nexus.

Activities – methodology development, education/energy/poverty literature review, methodology testing, methodology workshop

Outputs -Peer reviewed approach and tools that can be used in full-scale programme - methodology workshop report -report of the Activities in Uganda with recommendations and the way forward.

Methodology Conceptual Framework

The linkages to poverty are explained using the Sustainable Livelihoods concepts determined by human and social capital. Human capital is improved by education. Educational attainment comprises three components: Access, Quality and Equity. Therefore the work examines whether Access, Quality and Equity in education can be enhanced through the availability of modern energy services (see the Research Methodology annex).

Consequently, the main Education Research Question is; *How does access to modern energy service in community primary schools impact on education?*

Remaining activities: literature review and methodology testing

The presentation ended with an account of activities undertaken, thoughts and proposed actions on the education, energy and poverty study in Uganda. The sequence of events was:

- Involvement VOICE International to review literature on energy and education
- Localised issues in Uganda (who, what, why, etc.) key issues such as ERT implementation and ICT policy
- Identification of Makerere Institute of Social Research (MISR) as research partners

- Development of research approach and tools in UK
- Trial of approach and tools in Uganda
- Refinement of Tools in Uganda
- Workshop in Uganda to review approach and tools
- Developing informed/constituency in Uganda with joined up thinking.
- Recommendations for both Uganda and UK experts.

Discussion on the Background and Conceptual framework presentation
Participants' inputs were as follows:

- They applauded the importance of the study in establishing the relationship between energy, education and poverty. They also agreed with the presenter that energy and poverty interlink; such as effects of energy on health were clear but very little at all on education.
- They wanted to know whether the collaborative ministries such as Ministries of Education and Sports and Energy and Mineral Resources were informed and involved in the process. They were informed that the study has involved line ministries such as Ministry of Education and Sports and Energy and Natural Resources especially during the review of literature. In addition, their representatives were participating in this workshop to further make their inputs.
- They also want to be clear as to whether Energy is being considered as an issue of preference (electricity is near but people choose not to connect or use it) or accessibility (the connections are not close).
- Participants pointed out that awareness of the benefits of linkage must be accompanied by incentives such as loans and bringing energy sources nearer to the people/community for the research to have any practical benefit

CONCLUSIONS FROM THE LITERATURE REVIEW

The literature review presentation gave context for Uganda and a number of conclusions and recommendations were also listed. A few research activities were recommended to be undertaken in support for the proposed study.

Context

1. Uganda's electrification rate is very low, with grid access of only 5% for the whole country and less than 2% in rural areas

2. There are 2244 secondary and 12773 primary schools registered with MoES, of which 65% are wholly government funded and 35% are private, religious or community schools

3. Of the original cohort enrolling at the beginning of the Universal Primary Education (UPE) policy in 1997 only 22% of children completed their primary schooling.

Conclusions

1. The link between energy and the kind of educational attainment, which will reduce poverty in Uganda, is very strong.

2. The concepts of poverty, educational attainment and energy are not always clear in the Ugandan context. The connections between access to energy, educational achievement will be difficult to assess and quantify because of the problems of definition, and large number of factors to be taken into consideration.

3. The Energy for Rural Transformation (ERT) project provides an opportunity for research into links between access to energy and educational achievement.

4. Many of the reasons for primary drop-out are energy related (e.g. poor sanitation, lack of safe water, poor meals provision, poor teacher morale, lack of relevancy in curriculum to the mostly energy related needs of rural life

5. ICT in support of learning seems to be a strong motivating factor for both pupils and teachers.

6. There is no sectoral or national ICT policy in place, although discussions to develop policies have been proceeding for some years.

7. The existing projects in schools cover wide areas of educational activity with no evidence of strategic coordination.

Recommendations

1. Government of Uganda should be urged to conclude the process of development of a National ICT Policy and the Policy for the Education Sector.

2. Preparation of ESIPII provides an opportunity to improve the incorporation of ERT into education activity.

3. The existing policy of improving teachers houses, sanitation and water provision for primary schools should be linked with the ERT education component

4. The review of school curricula must prioritise improving the relevance of the learning experience from the point of view of rural communities (80% of the

population)

5. As the cost of acquiring and running conventional ICT is prohibitive, more cost effective ICT options should be explored. It is critically important to optimise the use of scarce resources. Therefore the identification and promotion of potentially successful collaborations is strongly recommended.

Recommended Research Activities

1. The evaluation of the ERT Project should be adopted to include a study on the performance of primary schools in communities benefiting from the project. The experience and skills of the Education Standards Agency (ESA) and Uganda Participatory Poverty Assessment Programme (UPPAP) should be brought together to accomplish this.

2. There should be a review of the evaluations of the four existing education based projects with a view to identifying potential for collaboration and coordination.

3. A comparative study should be undertaken which examine pupil and teacher motivation and performance. (In a group of schools and Teacher training colleges within the above projects with matched set of establishments outside of these initiatives).

Discussion on the literature review session were as follows:

The participants noted that lack of information on the linkage between education and energy creates a problem of conceptualization.

They wondered whether the statistics took into account the geographical distribution of schools (rural/ urban)

The issue of primary schools is very crucial because it targets communities. However, equity, access and quality should be disaggregated in terms of rural, urban and gender issues (see above).

Consideration should be given to the study's relevance and increase of awareness on rural electrification. It should also consider the cost of provision of ICT and energy in primary schools.

They questioned the role of ICT in enhancing education? They were informed that there is current no policy on ICT in Uganda; only draft policy that was being reviewed and that this is a problem. More so as there was no clear integration of ICT in the education sector.

They were in agreement that teachers' motivation was a significant factor but found it is very difficult to motivate pupils too. Therefore the study should also consider pupils' views on energy as being very important.

They recommended that in the development of the methodology some reflections be made on what DFID wants to achieve from the study and who are the key people to be involved in the study.

GROUP DISCUSSIONS ON THE QUESTIONNAIRES

The Workshop participants divided themselves into three groups to review the modified questionnaire. The first group reviewed the Head teachers/School Administrators section, the second group, took the Primary Teachers section and the third group the Parents/Guardians section. The groups' rapporteurs were the participants from MISR.

Each group was asked to review the given section of the questionnaire and report back to the plenary on the relevance of the questions; clarity of the questions; modification of questions; development of new questions and; any other issue relevant to the survey.

In addition each group was to come up with opportunities and needs regarding the proposed study. They also asked to identify limitations and barriers to the study. Finally the groups were to identify and list the priority tasks for follow-up.

Group 1: Head Teacher/Administrators Questionnaire Section

This group suggested the following changes in the Head Teacher/Administrators' Questionnaire:

- On page 4 on background section include: type of school, name of school, and enrolment in school by gender.
- Qn.2 instead of country or beyond put international
- Qn.6, it is not proper for a child of four year to be enrolled in primary level.
- Insert more rows on teacher retention table (on page 5)
- On page 6, qn.5 is not clear as how to calculate drop-out and completion rate.
- On reasons on educational attainment, Physical condition option should be broken down into: energy, electricity, laboratory, etc…
- Include another option on life skills
- Curriculum changes, ask a question to reflect life skills.
- Page 8 include a question to capture the distance in KMs from the nearest source of energy.
- Page 10 qn.3 include computer network e.g. LAN
- Page 11 qn.8 include communication and publishing
- Finally, the questionnaire should include some qualitative questions e.g.
    A. "How do you think computers can enhance education?
    B. Should the budget be increased or reduced in order to reflect energy usage?

Group 2: Primary School Teachers Questionnaire Section

The Group suggested the following changes in the questionnaire for Teachers:

- Include the name of the school
- Type of the school e.g. day/boarding, private/public (ownership e.g. mission/private for profit)
- Qn.4 should change to "Which classes and which subjects?"
- Qn.5 to change to "How many hours do you teach a week?" and years to start from 2001 to 2004.
- Qn.7 to "How much time?"
- Table for Teachers accommodation "bottled gas to "cylinder gas".
- Include options of generator and solar energy since the terms are in common use.
- Qn.2 should change "Is your accommodation provided by the school?"
- Qn.4 should change "If your house has electricity…?"
- Also the options should include Radio
- The table of teacher retention should have other options such as: school reputation and performance at PLE, extra curricula activities, and other fringe benefits.
- In the energy and education table, Qn 2 should have fifth category of "Not sure".
- Also other options here should include:

-storage of examination

-makes examination setting easier,

-updating my notes, and;

-updating scheme of work and lesson plans

Group 3: Parents /Guardians Questionnaire

The group members suggested the following changes in the parents/guardians questionnaire:

- Table 1 should include type of school, ownership, and category e.g. boarding/day, mixed or single.
- Qn.2 change to "how many children of your own do you have?" Then ask for the dependant children.
- On energy usage should include options such as cylinder gas, grid, solar and biogas.

- Ask for the major source of energy
- On educational attainment, add another question 7, “how many hours do your children spend on collecting firewood?”
- Add qn.8 “To what extent has your major source of energy helped/constrained your children in attaining education?”
- For table for Modern energy use should be restricted to “electricity and gas”.
- Qn.1 page 12 “why does not this home have electricity?”
- Qn.2 include code “Not Sure”. Also add options:

  - “avoid smoke which is health hazard”.

  -“gain of self-confidence due to familiarization”

  -“creation of higher aspiration/awareness among children”.

- Table for homes that have been electrified, Qn. 2 should be specifically related to the study.
- Add Qn.6 “How has this improved children’s education attainment?”

The following issues were identified Opportunities and Barriers.

OPPORTUNITIES AND NEED

The Groups discussed opportunities for advancing the research and proposed the following:

1. Seek out existing data in education (national drop out rates, retention rates, pass rates, etc.) from the census (economic activities, population densities, numbers of schools, etc.) from the utilities (electrification timetables) and use this information to ensure that the sample for study are selected from representative groups. This will ensure that a generic questionnaire can be adapted for the local context.

2. Consider collaborations with relevant projects and policies so that information can be shared e.g. the Energy decentralization policy – an opportunity to push energy for primary schools - and Electrification for Rural Transformation (ERT) supported by World Bank

3. Build in an element to the research methodology that considers ICT – however, this will mean broadening the scope of the study to cover secondary as well as primary schools (thus taking into account the secondary school syllabus on computer studies) plus need a policy on ICT to be formalised (this is a Ugandan specific element).

4. Consider looking at the study from a cost-benefit perspective. For example is the high cost of education in urban electrified areas related to the cost of electricity.

LIMITATIONS AND BARRIERS

The participants noted some limitations and barriers to the work that the researchers were trying to undertaken.

The first is resource availability. Unless the study can collaborate with agencies already running education/ energy projects the cost of data collection will be significant.

The effectiveness of energy in educational attainment will be shaped by government policy e.g. on ICT. This is outside the control of the research team.

The effectiveness of energy in educational attainment will also be determined by how sustainable the education energy links are. This is in turn affected by factors such as the continued affordability of power and equipment; other factors affecting enrolment and drop out, support for syllabus changes, etc.

CONCLUSIONS FROM THE WORKSHOP

The participants applauded the importance of the study in seeking to establish the relationship between energy, education and poverty. They also agreed that energy and poverty interlink; such as effects of energy on health were clear but very little at all on education and noted that lack of information on the linkage between education and energy creates a problem of conceptualisation.

Although the participants appreciated that the researchers were trying to develop a generic approach they through that it was very important to consider the context of each country and allow for this. E.g. educational attainment factors of equity, access and quality should be disaggregated in terms of rural, urban and gender issues and take into account various policies and projects being implemented.

They thought it important that collaborative ministries such as Ministries of Education and Sports and Energy and Mineral Resources were informed and involved in the process.

Participants pointed out that awareness of the benefits of linkage must be accompanied by incentives such as loans and bringing energy sources nearer to the people/community for the research to have any practical benefit. I.e. even if the study proves the benefits who will pay for electricification and how.

Related to this point, participants also want to be clear as to whether Energy is being considered as an issue of preference (electricity is near but people choose not to connect or use it and for what reasons) or accessibility (the connections are not close).

The study should also consider the role of ICT in enhancing education as an important Ugandan specific issue.

RECOMMENDATIONS

Participants recommended that the study should:

1. Ensure it takes into account the context of the country and local areas where it is being undertaken e.g. in fishing areas where pupils go in the evening to study.

2. Be broadened in scope, making primary the core but enhancing this with case studies on secondary schools and Primary Teacher Colleges

3. Be broadened in scope so that it examines the characteristics of a home with energy e.g. do the children have their own TV sets or radios and to what extent do they use them for education purposes

4. Ensure that it has an element of awareness raising for researchers, teachers and pupils

5. Ensure that it takes into account all the energy supply options relevant to the country

6. Works in collaboration with key actors, possible in an advisory role: e.g.
    - Ministry of Education and Sport - planning department
    - Ministry of Education and Sport – pre- and primary education
    - Ministry of Energy – Department of Energy

- Ministry of Finance – Poverty Unit
- University/Academia
- Private Sector/Civil Society Organisations
- Interested development partners
- Curriculum Development Centre

LIST OF PARTICIPANTS

No	Names	Designation	Address	Organisation
1.	Delius Asiimwe	Senior Research Fellow	delasi@imul.com misrlib@imul.com	Makerere Institute of Social Research
2.	Mark Kashaija	Research Assistant	kashaijamark@yahoo.co.uk	Makerere Institute of Social Research
3.	Denis Bataringaya	Research Assistant	bataringayad@yahoo.com	Makerere Institute of Social Research
4.	Mulyalya Carthbert	Senior Education Planner	Cmulyalya@education.co.ug	Ministry of Education and Sports
5.	Daniel Stern	Director	dstern@uconnect.org	Uconnect Schools Project Ministry of Education and Sports
6.	Grace Baguma	Curriculum Specialist	bagumad@yahoo.com	National Curriculum Development Centre
7.	Jeniffer Nansamba	Monitoringand Evaluation Officer	jnansamba@education.co.ug	Ministry of Education and Sports
8.	Martin Rutangye	Consultant	mnrutangye@yahoo.co.uk	Ministry of Energy
9.	Bill Rigby	Consultant	rigby@york.netkonect.co.uk	VOICE International
10.	Alison Bannister	Energy Poverty Specialist	alison.bannister@aeat.co.uk	Future Energy Solutions

Appendix D
Details on research areas where a requirement for further work was identified

---

Gender-energy-poverty

The limited field test findings, discussions with key stakeholders (prior to the research), and the review of process and findings undertaken at the methodology workshop have led to the identification of a number of key issues that require further research and clarification. Several of these are considered as urgent priorities as current assumptions that continue to be used to underpin policies on electrification in South Africa (and possibly other countries) may no longer be valid – evidence from the field trial suggested that a significant shift in gendered roles and responsibilities may have taken place in poor, urban communities, and that this may have wide reaching implications for energy / appliance use and associated decision-making processes.

The following questions are highlighted as areas where further research is required to clarify the current situations and provide input to future policy design (and possibly modification to existing policy implementations):

- ***Study on the gender-energy-poverty nexus in South Africa is urgently required.*** A key conclusion drawn from the literature review and stakeholder consultation, and supported by the findings of the limited field trial, is that the gender landscape in households is changing in South Africa. Women seem to have a stronger role in some areas, but why? And how exactly is it changing? How is this affecting decision-making regarding fuel selection & appliance purchase, for example, and who has primary responsibility for cooking and other household chores? A suitable title for this exploration may be '10 years of shifting social roles and responsibilities in South Africa – gender in demise, and policy implications'.

  These changes may also have occurred in other countries where, through empowerment, there has been a shift or merging of gendered roles and responsibilities but where policies are based still designed around the findings of outdated studies.

- ***What are the main burdens faced by women, and how can electrical appliances benefit women in areas that they consider a burden?***
  Given the lack of clarity on the issue of what tasks women in fact consider their main burdens, investigation into this area is urgently needed. The questionnaire used in the field trial did not explore this area in great detail, but nevertheless the findings may point to a critically important area for further research around maximizing the benefit of electrification for women. This has potentially major implications for energy policy and electrification practice.

How do women spend their time in the household? What is considered, from amongst cooking and the many other household chores, to be a burden to women specifically from their point of view? Do women want help from men and other women to relieve this burden or would they prefer to maintain the responsibility but reduce the time that these activities take up in their day? How can energy help free up time, or reduce the 'burden'? Is cooking a particular burden to women? Is cooking the primary energy-related burden faced by women? Is this situation improved by the introduction of electricity? Would electric cooking improve the situation? Is there, as reported in this study from a formal, urban settlement, a preference to use electricity for cooking? Should this be specifically facilitated? What are the constraints to such facilitation?

It is often said that providing electricity and labour saving devices, primarily to save the time taken to complete household chores, serves only to trench gendered roles and responsibilities. However, this is precisely the approach that has been adopted by the majority of households in developed countries. Even in countries where gendered roles have begun to merge and where men may assist with some of the household tasks, the primary responsibilities for these tasks still remain with women and girls.

There was a high degree of consensus on the importance of a fridge, and the resulting potential for pre-cooking and bulk buying. This may also be an important pointer to ways in which electricity could make life easier with respect to cooking. Clarification is required as pre-cooking did not appear to be widely practiced in filed test community, and bulk-buying practices, which necessarily require a higher household cashflow and often the availability of affordable transport, are not well understood.

There is a suggestion from the findings of the field test that washing machines may be amongst the most important appliances with regard to relieving women's burden. There is little, if any, evidence on whether the hand-washing of clothes is considered a burden? Can modern energy be used to reduce this burden? *(Observation from the field test conducted in urban formal households is that the next appliance that women wanted was a washing machine followed by a hot water geyser)*

- ***Do men face particular energy-related 'burdens'? What are these and what can be done about them?***
  This is related the issue above with regard to women's burdens. Similar questions need to be asked around the specific burdens faced by men within the household, and also with regard to income generation and farming in rural communities.

- ***What are the gender roles and responsibilities in decision-making around the prioritisation, selection and purchase of household electrical appliances, and in household budgeting? What are the benefits that actually result from these appliance purchases?***
  In South Africa, electricity demand in reality is often lower than originally predicted at the design stage. Further exploration of appliance acquisition and usage rates (as a consequence of household decisions made in relation to limited power availability or frequent power cuts) would enhance the accuracy of demand-side calculations and

lead to the implementation of power supplies that are able to deliver the intended positive benefits, particularly with regard to easing women's work in the household. The results obtained would also make a valuable contribution to understanding how women and men prioritise their need for, and expenditure on, electrical appliances, and the likely timing of appliance acquisition in relation to the introduction of electricity.

What are the specific wants and needs of both men and women with regard to electrical appliances? What are the preferences for appliance acquisition – women and men's perspective? Any these preferences realised? How? If not, why not? How are appliances obtained and paid for (explore the various options, and their advantages and disadvantages for poor households)? Do households acquire their selected appliances within an acceptable timeframe? What are the real benefits delivered through the acquisition of electrical appliances?[32]

Are there any related market-enabling mechanisms that provide opportunities for the accelerated acquisition of affordable appliances, particularly those that make a significant impact on easing cooking and other household chores or that reduce the time spent on these? Should these be introduced in tandem with electrification programmes? There are obviously many aspects of the design and introduction of such programmes that would require considerable research and consultation, and it would be essential for co-operation and integration between a range of organisations e.g. utilities, development agencies, community groups, NGOs, etc.

- ***How does the provision of 'basic' electricity impact on the lives and livelihoods of poor households?***
  Providing basic electricity – i.e. sufficient for one light bulb and one 2.5 amp plug socket – may have only limited impact on easing the tasks of household cooking and other chores. The following statement[33] captures one of the key findings which are common to many impact studies of electrification programmes: *'Electricity is not desired for its own sake, but for its ability, along with appliances, to produce goods and services that are more directly desired.'* In situations where the quality of electricity supply is very poor (limited hours and frequent, unscheduled periods without electricity), there is evidence that communities, households and businesses are reluctant to invest in electrical appliances, and that household, farming and income generating activities can be severely disrupted by the need to respond to intermittent power availability[34].

  To what extent is there a burden associated with electricity? What problems arise for poor households (and indeed for farming communities and micro- / small businesses) in 'electrified' communities as a consequence of inadequate or intermittently

[32] Barnes, 2000 study on 'Rural electrification and development in the Philippines: Measuring social and economic benefits' provides a design methodology to quantify the real benefits of appliances that could be applied to any examination with respect to gender

[33] From: 'Rural Electrification and Development in the Philippines: Measuring the social and economic benefits'. ESMAP, 2002]

[34] Recent observations in rural communities in India during the pre-energisation surveys for DFID KaR 8145 'Modern Energy: Impact on Microenterprise'.

available (e.g. unscheduled power outages) power supplies and associated services (e.g. local pre-payment vendors 'running out' electricity)?

- ***How does electrification influence the availability of other fuels / energy, and to what extent does fuel switching occur (or not) in electrified households?***
  Observations from the limited field trial in an urban community with formal housing which had been electrified for a number of years indicated that there is still substantial use of paraffin in winter and that this is the fuel of choice for heating in electrified homes. This has major implications for policy and programmes aimed at reducing indoor air pollution, given the commonly held view that electrification significantly reduces this problem. In addition, particularly in informal housing electrification is considered to reduce the risk of fires through a reduction in the use of paraffin.

  Should other modern fuels be made available alongside electricity – clearly electricity is the fuel of preference for cooking and fridges were also cited as making a significant contribution to the time / cost of food purchase (bulk-buying) and daily time spent on cooking (some pre-cooking and storage). Can biogas / LPG play a significant role as a fuel for cooking in rural areas? Should this be actively facilitated alongside in tandem with electrification?

  Why do households choose paraffin for heating, and could other affordable solutions be found? Does the provision of electricity indeed make a significant difference to indoor air pollution? Is this a seasonal issue? What are the financial costs of cooking and heating with different energy sources (this data and analysis should be developed and disseminated – this would equip communities and households to make informed choices, and to lobby for cost-effective fuel / energy to be made available).

- ***Problems associated with the use of the term 'gender'***
  The involvement of men in 'gender' issues is increasingly seen as vital to achieving equality however, use of this term may potentially discourage the participation of men in these projects and initiatives. Workshops and further research in this area, involving men and women, would be valuable.

  Do men and women perceive the term 'gender' differently? Does this differ with culture, between development organisations and in key stakeholder groups? Does this term invoke negative reactions? Is it time to move away from this term? What should replace it?

- ***Impact of HIV/AIDS on gender-energy-poverty linkages***
  Further research is required around the HIV/AIDS issue and its impact on gender-energy-poverty linkages.

  Who in the household needs special care? Who does the caring? What are the implications for women's burden? What are the possible food / nutritional implications? What are the resulting implications for energy consumption / costs? How do the different fuels / energy options used in household activities influence the

health and quality of life of HIV/AIDS impacted individuals? What are the policy implications in terms of providing appropriate fuel / energy choices?

Appendix E
Final Methodologies

CONTENTS

Appendix E1: Gender Methodology

E1.1 Refined methodological components for research on gender-energy-poverty linkages

E1.2 Questionnaire for pilot study of cooking and other household chores, and associated electrical appliance purchase, in low-income urban households in South Africa

Appendix E2: Education methodology

E2.1 Revised Post-Workshop Education Research Methodology

E2.2 Guidance for the Qualitative Questionnaire

E2.3 Original Quantitative Education Questionnaire

E2.4 Revised Quantitative Education Questionnaire

APPENDIX E1 - GENDER METHODOLOGY

Appendix E1.1
Refined methodological components for research on gender-energy-poverty linkages

---

The development, testing and refinement of methodological components for research on gender-energy-poverty linkages was focused on an issue considered key to women, especially in poor communities:

> 'cooking and other household chores, and associated electrical appliance purchase, in low-income urban households in South Africa'.

The main elements of methodology developed during the study are:

- A questionnaire comprising:
  - Quantitative questions *(designed to gather numerical data and other specific pieces of information)*
  - Qualitative questions *(these follow some individual quantitative questions and are designed to make an initial exploration of the How? and Why? underlying the answers given)*

- Examples of additional issues that need to be explored using fully participatory methodologies

For use in a full community survey, the methodology would also need to include the following initial steps and information gathering:

- Selection of community for the field research
- Legitimisation of the project team and the research within the community
- Development of a community characteristics record (key information about the community and its members)
- Selection and training of community researchers and field assistants
- Limited field test to ensure questionnaire is appropriate and effective
- Development of the data processing framework for analysis of results from the questionnaire
- Development of framework for presentation of the results

E1.1 Quantitative methodology

The refined questionnaire developed as a result of undertaking a limited field test and an extensive review by key stakeholders of the process, data collected and findings is provided in Appendix E1.2.

E1.2 Participatory components of the research

The primary source of issues to be further explored through participatory, qualitative research will be observations made by the project team researchers as a result of discussions with community leaders and representatives and conducting individual interviews during the quantitative community surveys. Each interviewer should be encouraged to identify and record those issues that he / she believes should be explored through the qualitative research.

As a result of the limited field test, a number of issues were identified and were used to create a series of questions (Table 1) that can usefully (and possibly more effectively) be explored using participatory techniques. These generic questions address a broad range of issues and provide the framework for 'drill down' opportunities that can be used by facilitators when designing the qualitative research.

Table 1: Some questions / issues for participatory work (examples arising from limited field test)

Question / Issue	Why qualitative?
What household chores are considered to be a burden by women?	The question of 'burden' was seen as a difficult area to investigate quantitatively (i.e. via questionnaires), and it was considered necessary to define the concept of 'burden' and explore burdensome tasks in a qualitative way (focus groups). It is essential to explore this from a women's perspective and within the context of the research community. Also relevant to consideration of men's burden (and their particular energy needs).
Is cooking a burden to women?	Explore qualitatively as with the broader question on household chores.
Appliance wants and needs	Qualitative research is necessary to explore this issue, as well as enabling the real benefits of appliances with respect to gender to be better understood
What method of purchase / acquisition was used for particular appliances (second-hand, lay-bye etc), and what was the source?	The high level of appliance ownership was somewhat of a surprise to both the field researchers from the community, other members of the project team and stakeholders. Due to the sensitive nature of some of the potential routes for appliance acquisition (e.g. those around stolen goods), it is considered best to explore this topic through qualitative work.
Who makes the decision to spend money on energy and appliances?	The decision-making process (as in any household in developed or developing countries, urban or rural) is a complex one and as such is less easily explored in simple quantitative questions posed in the questionnaire. The process involves consideration of many facets, including the availability and timing of finances, prioritisation, dialogue and dynamics between people in the household. This is a key issue that is more appropriately explored qualitatively since the complexities of the decision-making process are not likely to be accurately reflected in questionnaire responses.
Inclusion of HIV/AIDS in the research question	Although there are a number of questions that can be posed in a fully quantitative format, it may be more appropriate to use a qualitative approach if HIV/AIDS impacted households have been specifically included in the target sample.

Selection of participatory research techniques

A range of participatory research methodologies (for use in a one-to-one or group environment) is available. Key techniques and their possible uses are outlined below:

Table 2: Examples of participatory methods and their possible uses

Method	*Brief description*	*Useful for*
Timelines	Historical profile of longer term events or trends	Changes in vulnerability of different groups / individuals
		Impact of policy changes
Seasonal calendars	Graphical depiction of seasonal events or trends	Changes in vulnerability of different groups / individuals
		Understanding assets and coping strategies
Transect walks	Land use / activity maps based on walking through particular areas	Quality and quantity of natural capital
Resource maps	Maps identifying natural and other resources	Existence of shared natural capital
Social maps	Maps locating key social features	Access to services and infrastructure
Preference ranking	Ordinal ranking based on pairwise comparisons, with reasons stated for the choices	Livelihood strategies, assets, access to services
		Understanding impacts from individual / community perspective
Matrix ranking	Preference ranking based on defined criteria with scoring	Access to infrastructure, livelihood strategies, investment choices
Wealth ranking	Assigned households to well-being categories	Strategies and assets needed to exit from poverty; relations between social groups
Venn diagrams	Diagrammatic representation of key institutional interactions	Social capital, relations between social groups, institutional and policy environment

Extracted from DFID Sustainable livelihoods guidance sheets Feb 2000

All of these techniques have the potential to add significantly to our understanding of the data gathered through the quantitative survey. The overall approach and the methodologies selected will be based on observations of the project team and insight gained during the quantitative survey. The use of some of the participatory techniques could be problematic in situations where individuals have limited experience of thinking in spatial and / or historical terms or where numerical skills are not well developed.

Guidelines on the management of participatory were developed as part of the on-going DFID Project R8145 ‘Modern Energy: Impacts on Microenterprises’. These are provided below (Table 3) for information.

Table 3: Some guidelines for management of participatory research

Guidelines for management of the participatory research

1. It is important to ensure that the qualitative research components enable the community members to provide the project team with their views and that we gain an understanding of the issues / information from their perspective.

2. The research approach could utilise a range of methodologies depending on the issues being explored and the context:

   - Group sessions with defined groups.
   - Individual, in depth, interviews with selected groups.
   - Focus groups on livelihood linkages and particular issues.

3. The nature of this interviewing and discussion approach will include features such as:

   - Highly open ended, participatory, neutral and cross cultural.
   - Double interviewer from the project team to allow for real time feedback – processing, validation, classification and identifying areas for more investigation.
   - Participatory approach with skilled social analysts.

4. Facilitators (project team members and local counterparts) will have role in both one-to-one interviews and group discussions however, this should be carefully managed such that it is the community participants that speak for the majority of the time during these sessions. This needs to be undertaken by a skilled researcher who is able to adapt the various generic approaches to create an open and effective environment in which facilitator / interviewer, interviewee and translators feel able to fully contribute. This must be neutral and without prejudgment. It will also be absolutely essential to ensure confidentiality, legitimacy with the community, micro enterprises and respondents and that trust is established and honoured by the research team.

5. Participatory work requires a structure within which to take place but the outcomes and the detailed path of the Q&As will be dictated by the responses of the participants: it will be essential for facilitators to be observant and engage in real time feedback. The style will be mainly 'open' questioning and it is essential that the framework of 'open' questions used to facilitate exploration of an issue within a focus group session, one-to-one interview or other participatory methodology is prepared beforehand (although must not be prescriptive or restrictive i.e. must allow free flow of ideas and views from the participants within the planned framework).

6. In order to fully capture the views / answers and the overall discussion, it will be necessary for notes to be taken throughout the proceedings (i.e. at least one of the project team must be taking notes at any one time: the composition of the team that facilitates each focus group needs to be a minimum of 2 project researchers + 1 community assistant).

7. It is likely that at some point during a participatory research session the facilitation and answers will be wholly in the local language. To ensure that all those present understand these answers and can participate in / record the discussion, it will be essential to also maintain proactive local language facilitation / feedback into English. Briefing of the research assistants and interpreters will need to emphasise these requirements (coaching may be required to provide some practical experience prior to the 'live' sessions).

8. As part of the project methodology an undertaking is given to all respondents that the results of the research project will be shared with them, in an appropriate manner and at an appropriate time.

Appendix E1.2: Questionnaire for pilot study of cooking and other household chores, and associated electrical appliance purchase, in low-income urban households in South Africa Dec 2003 – Jan 2004	Interviewer name: Date: Quest No:

Notes:

- This questionnaire is the edited version of the one used in the fieldwork. Edits reflect what was learned in the detailed processing and analysis of the completed questionnaires, as well as the post-fieldwork workshop.
- The changes in the questionnaire from the fieldwork version are marked in red text (additions) or strikethrough text (deletions).
- Brief notes on the changes made are included in 'notes' boxes such as this.
- The questionnaire is not formatted for fieldwork use because it includes annotations. When properly formatted it should be no longer than 8 pages, and take under 1 hour to complete.

(Note: interview the person that does much of the household cooking and other chores)

Introductory note (read to respondent): We are interested in gendered cooking practices and other chores in households in urban communities in South Africa, and what energy (paraffin, electricity, wood etc) is used for cooking and other activities. We are trying to see if there's a way to make women's lives easier with regard to access to appliances and different energy supply. We hope to influence policy-makers with the findings. Information you give will be kept confidential.

Respondent name:		Area:	
Age:		Street:	
Male / female:		House No:	

1. HOUSE & PEOPLE	**Formal**	**Backyard shacks**
House type (can be more than one) **TICK**:		
No. people in each:		
Number of people that eat in the main house?:		
When was the house built?		
When was the house connected to electricity?		

Husband and wife (or couple in similar relationship) living in main house? **TICK**	Y	N

2. HOUSEHOLD MEMBERS (detail)

	Person (name)	Relationship (grandparent/husband/ wife/daughter /son /relative /friend etc)	M/F	Age (approx)	Employment status (TICK)				
					scholar/ student	pensioner	not employed	permanent employmt	casual/temp employmt
1	respondent								
2									
3									
4									
5									
6									
7									
8									
9									
10									

3. ENERGY USE PER MONTH

	Qty used/mth (optional)	Cost R/mth		Qty used/mth (optional)	Cost R/mth
Electricity	kWh	R	Wood	kg/bundles	R
Paraffin	lit	R	Candles	Packets	R
LPG (gas)	kg/cyl	R	Battery – dry cell (PM9, PM10, torch)	No.	R
Coal	kg	R	Car battery	charges	R
			Other (specify)……		R

4. BUYING ENERGY

Energy source used	Who decides to buy and when to buy? (man/ woman / daughter/ son /…..)	Who goes to fetch/buy? (man/ woman / daughter/ son /…..)	Who provides the money? (man/ woman / daughter/ son /…..)	How much do you buy/fetch at a time?
Electricity				R
Paraffin				R
LPG / gas				R
Coal				R
Wood (bought)				R

Do you collect wood (for free)?	Yes, often	sometimes	No

IF YOU DO, who fetches? | …how much at a time?

Notes:
- 'Who pays' has been changed to 'Who provides the money' in the table above.

Is it a **problem to buy/fetch….. (only ask for fuels used)**

….electricity?	Yes	No	IF YES Why?……
…paraffin?	Yes	No	IF YES Why?……
…LPG / gas?	Yes	No	IF YES Why?……
… coal?	Yes	No	IF YES Why?……
…wood?	Yes	No	IF YES Why?……

What do you think **uses most energy** in the house **['most' mark with (1), second (2), third (3)]**

Heating house	Cooking	Heating water	Lighting	Fridge	TV	Iron	Other (specify)……..

5. WINTER (SEASONAL) ENERGY USE

Do you use more energy/fuel in winter than summer? (**TICK**)

Yes	No	Don't know

IF YES: What energy source/fuel?

Elec	Paraffin	LPG (gas)	Coal	Wood	Other (specify)……..

IF YES: What do you use **more** fuel/energy for in winter? (**TICK**)

Heating house	Cooking	Heating water	Lighting	Other…….……..

…can you estimate how much **more** you spend on energy in winter (per month)?

R

~~What is the main energy source/fuel used for heating the house? (**TICK**)~~

~~Elec~~	~~Paraffin~~	~~LPG (gas)~~	~~Coal~~	~~Wood~~	~~Other (specify)……..~~

Notes:

- Above question deleted because it is repeated later in the questionnaire.

6. PREFERENCES

Which fuels/energy do you **PREFER for the following (whether you use it or not)**? (**TICK**)

	Elec	Paraffin	LPG (gas)	Coal	Wood	
…cooking?						Why?……..
…heating the house?						Why?……..

Which would you **rather NOT use for the following (that you ARE using)**? (**TICK**)

	Elec	Paraffin	LPG (gas)	Coal	Wood	
…cooking?						Why?……..
…heating the house?						Why?……..

7. Which **APPLIANCES** are in the house? (**TICK BLOCK**)

Appliance (TICK)	When did you buy/get the appliance? (year)	Appliance (TICK)	When did you buy/get the appliance? (year)
ELECTRIC		**PARAFFIN**	
Lights		Lamp	
Heater		Cooker (wick)	
Hotplate		Cooker (pressure)	
Stove/oven		Heater	
Microwave		Other ……	
Iron		**LPG/GAS**	
Fridge		Lamp	
Fridge/freezer		Cooker (ring)	
Freezer		Cooker (stove)	
TV		Cooker (oven)	
Hi-fi		Heater	
Kettle		Fridge	
Frying pan		Other ……	
Geyser		**WOOD**	
Other ……		Stove	
Other ……		Other ……	
Other ……		**COAL**	
Other ……		Stove	
Other ……		Other ……	

Are any of the above listed appliances not working? **TICK** | Y | N |

Which?

……

Who usually decides to buy appliances? (**can be more than one**)?

grand-mother	grand-father	man	woman	son	daughter	Other (specify)……

Who usually provides the money to buy appliances? (**can be more than one**)

grand-mother	grand-father	man	woman	son	daughter	Other (specify)……

Do you or other household members consult each other before buying an appliance? **TICK**	Y	N	Sometimes

Who consults with who?……

Do you usually buy/get new or second-hand appliances? **TICK**

New	2nd hand

How do you normally buy appliances? (**can be more than one**) **TICK**

Cash	Lay-bye	Install-ments	Other ……

Notes:

- The original questions included in the appliance table of 'Who paid for the appliance' and 'Who decided to buy the appliance' have been taken out, as the responses were invariably the same for all appliances, and to explore the issue in more detail is too time consuming for such a questionnaire. Instead, the above general questions regarding appliance purchase decisions have been added.
- The 'What are the main benefits of the appliance' question has been deleted from the appliance table as it was found to duplicate information given by respondents in other sections of the questionnaire.
- The question 'How long have you had the appliance' has been added.
- The question on 'Which appliances are not working' has been added to ensure that there is clarity on which appliances are actually being used.
- Questions on means of appliance acquisition have been added. It is recognised that this area needs to be supported by qualitative work, however the questions included are of value in providing basic quantitative data as background.

What other appliances would **you (not your family) most** like to get still?

1. …… Why?…….. ……

2. …… Why?…….. ……

What would you need to get these? ……..
……

…..……

Notes:

- Changed from 'Why have you not got these?'

What other appliances do you think **your family (not YOU)** would most like to get still?

1. …… Who wants this?…….. ……

2. …… Who wants this?…….. ……

3. …… Who wants this?…….. ……

8. COOKING

Who supervises/is in charge of the cooking?

grand-mother	grand-father	man	woman	son	daughter	Other (specify)……

MEALS:	**Cook meal?**			**Who cooks the meal?** (man/ woman / daughter/ son / grandmother…..)	**Who helps with cooking?**	**How long does it take to cook (incl. preparation)?**	**What food normally cooked?**
Break-Fast	Y	N	Some-times				
Lunch	Y	N	Some-times				
Supper	Y	N	Some-times				

Do you ever **buy** prepared/pre-cooked meals? **TICK**

often	sometimes	rarely	never

Do you ever pre-cook meals for the household? **TICK**

often	sometimes	rarely	never

Do you think pre-cooking is a good idea? **TICK**

Yes	No	Not sure

Why?……

……

Do you like cooking? (if not the main cook, do you know if she/he likes it) **TICK**

Yes	No	Its OK

Reasons/comments……

……

Who mainly chooses what food is to be cooked?

grand-mother	grand-father	man	woman	son	daughter	Other (specify)……

Do you (or the main cook) feel you get enough help with cooking? **TICK**

Yes	No	don't need help

If NO, please explain……

……

Would you like other people in the household **to take over main responsibility** for feeding the household? **TICK**

Yes	No

Why?……

……

If YES, who should do it? ……

Who usually cleans up after supper (the main meal)? – (can be more than one)

grand-mother	grand-father	man	woman	son	daughter	Other (specify)……

Notes:
- The above question has been added – cleaning up is a part of the cooking activity, and gender roles in this regard also need to be clarified.

Do you (or the main cook) feel you'd like to **improve** the kitchen? **TICK**

Yes	No	Not sure

How would you improve it?……

……

IF WANT TO IMPROVE IT: What would you need to improve it? ……..

……

Notes:
- Changed from 'Why don't you improve it?'

~~Do you feel that the man/men in your family have ever stopped you getting kitchen appliances you want? **TICK**~~

~~Yes~~	~~No~~	~~Not sure~~	~~No men in family~~

~~Reasons? ……~~

Notes:
- Question deleted – it is considered too coarse. This is explored in section 7

9. FOOD COOKED

If you could **choose from any foods**, what foods do you think are the most important to cook?

Food	**Why?**
1.	
2.	
3.	
4.	

Notes:
- Question format restructured into above table

Are there any foods you would **like to cook** that you're **not** cooking? **TICK**

Yes	No	Not sure

IF YES, what food?……

IF YES, why not? ……

……

Notes:

- It is debateable whether the entire 'Food cooked' section should be retained in this questionnaire. The information obtained can provide some (though limited) insight into household nutrition, but provides no gender-related insight and nothing new was learned regarding appliances and food from responses. Also, the area of nutrition is more complex than can be reasonably explored in this questionnaire.

10. ENERGY & COOKING

What is the main energy source/fuel used for cooking? (**TICK**)

Elec	Paraffin	LPG (gas)	Coal	Wood	Other (specify)……..

Do you run short of elec/fuel to cook with? **TICK**

never	sometimes	often

IF YOU DO, why do you run short?……..…….

…….

IF YOU DO, what do you do when you run short?…….

…….

What is the main appliance used for cooking? (**mark with '1'**) Other appliance used? (**mark with '2'**)

Elec hotplate	Par (wick)	Gas (ring)	Coal stove	Wood stove
Elec stove/oven	Par (pressure)	Gas (stove)	Coal Mbawula	Wood fire
Microwave	Other (specify)……		Other (specify)……	

IF USING MORE THAN ONE APPLIANCE: Why? What's the difference between them?……

…….

…….

*If you could choose from any (whether have it or not), what are **the best** appliances for cooking?(**first choice mark with '1', second with '2'**) **TICK***

Elec hotplate	*Par (wick)*	*Gas (ring)*	*Coal stove*	*Wood stove*
Elec stove/oven	*Par (pressure)*	*Gas (stove)*	*Coal Mbawula*	*Wood fire*
Microwave	*Other (specify)……*		*Other (specify)……*	

~~*Why are these best?*~~

~~……~~

~~*IF YOU DON'T HAVE: Why don't you have these?*~~

~~……~~

Notes:

- Above section deleted, as does not generate useful responses beyond what is already learned from other parts of the questionnaire.

Which appliance would you rather **not** use for cooking (whether you have it or not)? **TICK**

Elec hotplate	Par (wick)	Gas (ring)	Coal stove	Wood stove
Elec stove/oven	Par (pressure)	Gas (stove)	Coal Mbawula	Wood fire
Microwave	Other (specify)……		Other (specify)……	

Why? ……..……

……

Do you have an idea of how much of the total elec/energy use goes to cooking? **TICK**

small bit	quarter	half	three quarters	most	All	Don't know

11. TIME

Do you (or the main cook) have enough time for cooking? **TICK**

Yes	No	Sometimes

Say which FOUR tasks you spend most time doing during a normal weekday (TICK):

Working (job, business, etc)		Watching TV		Meetings, church, community activities	
Travel		Resting/reading/leisure		Other (specify) ……	
Washing		Cleaning		Other (specify) ……	
Ironing		Looking after children		Other (specify) ……	
Cooking		Shopping		Other (specify) ……	

Do men help with chores? **TICK**

Yes	No	Sometimes

IF YES: Which? ……..……

……

IF NO: Why not? ……

……

Notes:

- Above section 'Do men help' has been added to gain insight into possible shifts in gender roles.
- A detailed analysis of tasks that women consider chores is beyond the scope of the questionnaire, and needs to be done qualitatively.

12. ELECTRICITY & COOKING

What fuel were you using to cook before electricity (**can be more than one**)? (**TICK**)

Paraffin	LPG (gas)	Coal	Wood	Other (specify)……..

Do you still use these fuels for cooking? **TICK**

…paraffin	Often	Sometimes	No
…LPG (gas)	Often	Sometimes	No
…coal	Often	Sometimes	No
…wood	Often	Sometimes	No
other (specify) ……	Often	Sometimes	No

Is cooking with electricity….. **(TICK)**					
	quicker	slower	same	don't know	~~Why?……~~
	cheaper	more expensive	same	don't know	~~Why?……~~
	cleaner	dirtier	same	don't know	~~Why?……~~
	~~more convenient~~	~~less convenient~~	~~same~~	don't know	~~Why?……~~
	safer	less safe	same	don't know	~~Why?……~~
	healthier	less healthy	same	don't know	~~Why?……~~
	Don't use electricity				

~~Any other **good or bad** points about using electricity for cooking?……~~

~~……~~

Notes:

- Format of 'Do you still use these fuels' question changed to accommodate more than one fuel.
- The 'Why' section of the 'Is cooking with electricity…' question has been deleted – nothing new is learned from responses (responses very similar to reasons given for using energy sources or appliances in other parts of the questionnaire).
- The 'more convenient' section of 'Do you still cook with electricity' question has been deleted – the term often translates in Xhosa (or other languages) differently, and can thus be misleading unless it is unpacked – which is not easily done in a questionnaire.
- 'Any other good or bad points about using electricity for cooking' question deleted – no useful responses obtained.

13. INCOME

Monthly household income estimates (TICK)	R0-500	R500-R1000	R1000-R2000	R2000-R3000	R3000 +
Formal (job) – Source 1					
Formal (job)– Source 2					
Formal (job) – Source 3					
Pension – Source 1					
Pension – Source 2					
Other 1 (informal, own business etc)					
Other 2 (informal, own business etc)					
Child grants					
Stokvel/savings payouts					
Remittances					
Other (Specify ……)					

Notes:
- The above income table was moved from earlier in the questionnaire. It was found that, because income is such a difficult area to obtain reliable information, and one of potential discomfort for the respondent and enumerator, it was advisable to ask these questions once the relationship between respondent and enumerator was slightly better established – i.e. later in the questionnaire.
- 'Stokvel/savings payout' has been added.

14. FRIDGE & FOOD

Do you think a fridge is important? **TICK**

Yes	No	Not sure

Why?…… ……

……

IF HAVE A FRIDGE: Who benefits most from having it in the house?……

~~Why?…… ……~~

Notes:
- The 'Why' part of the question deleted because reasons given were almost always a repeat of 'Why' responses given to previous question.

IF HAVE A FRIDGE: What do you keep in the fridge mainly? …….

……

IF HAVE A FRIDGE: Has a fridge changed…

…the food that you	Yes	No	IF YES How?……..

cook?			
…how often you cook?	Yes	No	IF YES How?…….……..
…how you buy food?	Yes	No	IF YES How?…….……..

15. HEATING THE HOUSE

Who is responsible for keeping the house warm in winter? (can be more than one) **(TICK)**

grand-mother	grand-father	man	woman	son	daughter	Other (specify)……

What is the main energy source/fuel used for heating the house? (**TICK**)

Elec	Paraffin	LPG (gas)	Coal	Wood	Other (specify)……..

What is the main appliance used for house heating? (**mark with '1'**) Others used? (**mark with '2'**)

Elec bar heater	Elec fan heater	Par heater	LPG/ Gas heater	Coal mbawula	Wood fire
Other (specify)……			Other (specify)……		

IF USING MORE THAN ONE APPLIANCE: Why?……

……

*Choose **the ONE best** appliance for heating the house (whether you have it or not)? **TICK***

Elec bar heater	Elec fan heater	Par heater	LPG/ Gas heater	Coal mbawula	Wood fire
Other (specify)……			Other (specify)……		

Why is this best? ……

……

IF DON'T HAVE IT: Why don't you have it? ……

……

Which appliances would you **rather not use** for heating the house (whether have them or not)? **TICK**

Elec bar heater	Elec fan heater	Par heater	LPG/ Gas heater	Coal mbawula	Wood fire
Other (specify)……			Other (specify)……		

Why? ……

……

16. GENERAL

Any general comments? ……

……

……

……

THANK YOU FOR YOUR TIME!

APPENDIX E2 – EDUCATION METHODOLOGY

Appendix E2.1
Revised Post-Workshop Education Research Methodology

1. Introduction

The Energy to Reduce Poverty research methodology outlined in the following sections of this document is intended to provide greater understanding of the importance of modern energy services as a key enabler in meeting poverty reduction targets underpinned by the Millennium Development Goals (MDGs).

The methodological framework focuses on the potential role of energy in achieving MDG 2, Universal Primary Education, wherein education is recognised as a powerful instrument for reducing poverty and inequality, improving health and social well-being, and laying the basis for sustained economic growth[35]. The various inhibitors to achieving UPE are related to access (cost, proximity, transport, communications, facilities and the provision and distribution of resources), quality (related to weak curriculum development, poor teacher training and retention) and ethnicity/equity (related to cultural and gender differences).

This study is based on the premise that though energy permeates many aspects of human activity, little research has been conducted that tests the significance of the linkages between modern energy service provision and poverty reduction (in this case through education) to the satisfaction of policy makers responsible for prioritising and addressing the various poverty reduction options.

What this methodology provides is tools and methods for assessing the impact of modern energy services on education related to access and achievement. It will also be useful for testing the validity of two perceptions of the development community in existence at the time of the research:

- the belief by poor households that education has low economic value;
- the belief by education practitioners that the provision of modern energy services in the developing world does not improve the effectiveness of education.

What this methodology intends to research is that energy enables greater efficiency of productive activity that frees up time to focus on other forms of activity such as education which is a particularly pertinent point in relation to school age children occupied in households/commercial production.

[35] Extract from www.development.org/education.htm, downloaded on November 25th 2002.

In this context, poverty is defined as "the inability to maintain a minimal standard of living or welfare in terms of basic consumption needs or the income and resources required to satisfy them". However, to reflect the complex and multi-dimensional nature of poverty both quantitative and qualitative research will be undertaken in this study.

1.1 Background to Enpov

The purpose of the Energy to Reduce Poverty project is to examine whether linkages between energy and poverty reduction exist through relevant sectors and themes such as health, education, environment and gender, in order to identify gaps in information that would provide support to development practitioners working in the energy-poverty field. This education research methodology is designed to explore potential linkages and provide quantitative data for a series of indicators that can be used by development practitioners and government to underpin policy and resource allocation.

The initial review conducted by skilled development practitioners found a plethora of quantitative data and research on the impact of energy on health and the environment, however, little information emerged with regard to the gender-energy-poverty and education-energy-poverty nexus.

The methodology contained in this document attempts to bridge the gap in information related to education-energy-poverty linkages. This is achieved by broadening the scope of the research required to identify positive and negative impacts of modern energy services on schools and communities, using both quantitative and qualitative tools as indicators. A similar methodology and research is being conducted on gender-energy-poverty linkages under the Energy to Reduce Poverty project.

This methodology will be reviewed at a Peer Review Workshop to be held in Kampala, Uganda during February 2004.

1.2 Background Uganda / Africa

The main educational priorities in Uganda (as with other African countries in the region) are Access, Quality and Equity. The Ugandan government promote the fact that modern energy services can have a quantifiable impact on the curriculum menu, teaching methods and improvements in school facilities. The government want students to leave school as "confident, creative, productive users of technology"[36] ready to join the national work force.

An Education Review conducted in Uganda under this study highlights the importance of energy inputs in education. Uganda's Poverty Reduction Strategy Paper (PRSP) priorities, reflected in the outcome of the Workgroup on Education Sector session held in October 2002, clearly relates energy inputs in education as

[36] Reference

necessary for improving the quality of education through a variety of measures that include internet access in order to facilitate distance learning for teachers. Priority is given to the installation of photovoltaic systems where no grid exists, to be integrated as packages that include ICT, water, pumping, grinding, heating and lighting facilities.

There are various energy initiatives being conducted in Uganda, including the World Bank funded Energy for Rural Transformation programme that will assist in the acceleration of rural access to energy over the next ten years. The programme focuses on supplying electricity to key potential rural users and through the promotion of cross-sectoral linkages such as electricity and ICTs together with SMEs, health, education, agriculture and water.

Though the government see energy, poverty and education separately as important areas of concern, as exemplified in their Poverty Eradication Action Plan, and other important planning documents, the concepts of poverty, educational attainment and energy as not always clear in the Ugandan context. "The connections between access to energy, educational attainment and poverty will prove difficult to asses and quantify due to the problems of definition and the large number of additional factors that must be taken into consideration"[37].

2. Outline

2.1 Outline of Document Content

This document describes the methods and techniques that will be used to establish linkages between energy, education and poverty under this research project. The chronology of the steps to be outlined in this document, relevant to accomplishing the task are set out below:

1. The development of a methodology and research techniques as a theoretical written document.
2. A limited test to establish the validity of the methods and research techniques will be conducted in two selected communities in Uganda.
3. A peer review in the form of a workshop to be held in Uganda.
4. A Report to DFID to present the results of the study and provide a costed programme to address key gaps identified in our understanding of the energy-education-poverty nexus.

This document therefore represents a consolidation of all the methodology up to Phase 1.4 of the research.

2.2 Exclusions

The questions and aspects that are expressly excluded from the scope of the methodology include:

[37] Voice International, Review of Education Literature and Activities, Uganda

- An examination of impacts of energy services at the household level. Under the scope of this study, focus is limited to schools and communities.
- The research does not wholly adopt Sustainable Livelihoods Approach, using only human and social capital variants in its conceptual framework.
- The quantitative analysis is focused primarily on information from principal/head teachers; teachers and, to a limited extent, the community and energy service providers. It does not include information derived from children, though the views of children are explored through the qualitative research.

3. Research Questions

3.1 Research Questions

The fundamental research question is:

How does access to modern energy services in community primary schools impact on education?

The purpose of addressing the above question is in order to reflect on the ways in which the provision of modern energy services to schools and communities can positively impact on educational achievement, leading to improved livelihood strategies and sustainable poverty reduction. The questions below are designed to encompass the range of issues that application of the research is intended to reflect and, provide a context for the specific aspects of the energy-education-poverty nexus to be explored under this study.

- What community level decision-making processes are impacted by the provision of modern energy services?
- In what ways do new forms of energy services enhance or displace existing services and how does this affect vulnerable groups within the community?
- Who in the community gains and who looses from the introduction of modern energy services?
- How does the provision of modern energy services impact on the human and social capabilities of a community?
- In what ways does the provision of modern energy services assist in the reduction of poverty through educational attainment?

Answers to these core questions underpin the research framework and provide context for the qualitative and quantitative questionnaires that are dealt with later. With regard to education specific issues, questions with regard to Access, Quality and Equity are outlined below:

- **Access** in this context refers to how the cost of education is affected by the provision of modern energy services and whether this has an effect on the increase or decrease in enrolment levels. For example, can electricity in schools impact positively on enrolment and is this better or worse for communities that are also energised. This also relates to how energy provision also enables improved use of fixed assets such as classrooms (e.g. for evening study by pupils and adults alike).

- **Quality** of education in this context relates to whether the provision of modern energy services enables improvements in teaching quality by enabling access to computer and internet services, improved facilities (for production and sanitation) and teacher retention (as provision of modern energy services extends to their accommodation).

- **Equity** in education in this context refers to how the provision of modern energy services both at school and in the community enables greater access to education for girls at the primary level. Under this heading, equity of access also applies to

adult learners and other marginalized social groups within the specified community.

3.2 Analytical Framework

A Sustainable Livelihoods Approach informs this research by providing an analytical framework for how the provision of modern energy services enables/disables the development of **human** and **social** capital in the defined communities. A Sustainable Livelihoods Approach places the analysis of livelihoods within a comprehensive framework with an established typology of assets that poor individuals, households and communities deploy as strategies for alleviating poverty and sustaining livelihoods.

Human and Social assets will therefore support the research framework as vehicles for understanding the micro-level conditions and livelihood determinants that are affected through the provision of modern energy services.

- ***Human capital***. Education is a main component of human capital and traditional quantitative literature on human capital concentrates primarily on rates of return to schooling. In this context, human capital is therefore embodied in individuals through accumulated learning in formal and non-formal education. The focus is on whether the provision/non-provision of energy services in primary schools and local communities leads to increases in the levels of enrolment, access, teaching quality, advanced technological teaching tools and methods, improved facilities and infrastructure.

- ***Social capital***. Social capital relates to the norms and networks that facilitate joint and other collaborative community based actions and results in enhancement of community (and by extension individual) well-being. Though measuring social capital is difficult as it involves levels of trust and reciprocity, focus will be on the number of social networks pre and post energisation and the share and part that local people play in this. Social capital will also be reflected in the number and types of additional benefits/dis-benefits that modern energy services provides that increases the stocks and shares available to community members and groups.

In order to establish the cause and effect relationship between the provision of modern energy services and improved access, quality and equity of education, and the various levels of impact, the perceptions of a wide range of groups will be sought. These participants will include, but not be limited to, single parent households Female Headed Households – FHH and Male Headed Households – MHH, as well as other distinct social groups and groups with specific vulnerabilities.

The following diagram of Conceptual Linkages illustrates the assumptions made under this research that the provision of energy services in schools can enable greater teacher retention, improved enrolment rates, positive changes in the curriculum menu, ultimately supporting MDG and UPE achievement. On a community level, the diagram outlines how access to energy services for communication and production

can lead to positive benefits through reduction in domestic drudgery, improved access to educational facilities for adults and additional cost and time savings. What the Sustainable Livelihoods approach helps to illustrate is that access to energy services has potential to increase the stocks of human and social capital within a community leading to less vulnerability, better quality of life and security.

Diagram of Conceptual linkages

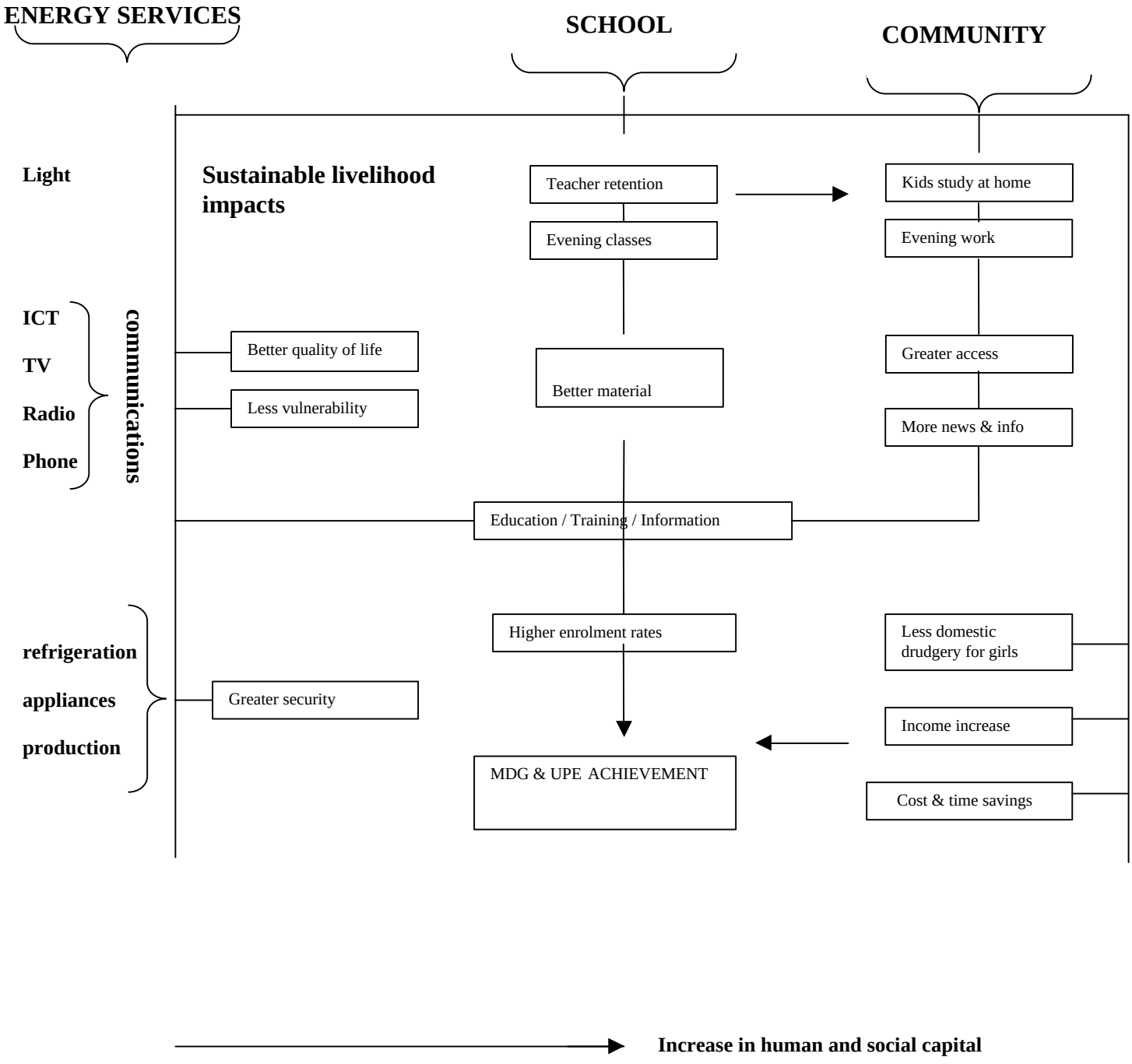


Diagram conceptualised and composed by Jacqueline Grant, Future Energy Solutions

3.3 Assumptions

The research methodology is designed to support the achievement of the Millennium Development Goals, specifically MDG 2, to "ensure Universal Primary Education" (UPE) and in doing so focuses attention at the school and community level, with no household level analysis. In supporting achievement of the MDGs the research assumes that the provision and easy access of modern energy services can enable:

- Increases in attendance and reduction in drop-out rates;
- Promotion of learner friendly environments in schools through access to clean water, improved sanitation, lighting and space heating/cooling;
- Increased access to education media and communications and ICTs in schools and adult training.
- Increased teacher retention (through improved teaching facilities, information services and energised housing)
- Lighting for the provision of evening classes in schools (for the benefit of students, adults, the community);
- Increased community access to school facilities and services.
- Liberation of children from heavy involvement in survival activities;
- Reduction in child labour activities resulting from use of labour saving domestic appliances;
- Lighting for home study beyond daylight hours;

4. Methodology

1.1 Quantitative and Qualitative Research Methods

The research uses both quantitative and qualitative information for understanding the range of issues, and providing the context for future planning and decision-making initiatives in the energy-education-poverty arena.

4.2 Quantitative Indicators

The purpose of the quantitative indicators is to establish the extent of change due to the availability of modern energy services in a defined area, region, or country and, wherever possible, will be supported by historical and secondary data that substantiates or provides additional information. The quantitative indicators can provide information concerning the dimensions of outcomes but cannot provide information that reflects cause and effect. The quantitative indicators will enable us to determine the level of modern energy coverage in local and regional schools and their surrounding communities.

The quantitative indicators outlined under principal/head teacher below are designed to reflect changes in the cost of education; quality of education on teachers and pupils; where possible, educational attainment; additional school facilities that benefit from

energy services. What are the costs to the school, pupils and the community with the provision of modern energy?

Participant	Indicators
PRINCIPAL/HEAD TEACHER	Pre and Post Energisation ▸ Funds spent on energy services ▸ Funds spent on traditional teaching materials ▸ Funds spent on non-traditional teaching materials, e.g. ICTs etc., ▸ Fees charged to pupils pre and post the provision of modern energy services ▸ Teacher retention rates (pre and post provision of energy services) ▸ Impact of energy services on fee levels ▸ Funds spent on maintenance of ICT and appliances ▸ Services that the provision of modern energy has enabled ▸ Number of children (rate of children at school, absent) – girls/boys

4.2.2 The indicators reflected under Teachers below focus on the impact of modern energy services on teachers in relation to the extent to which it has increased the working day; enabled broader learning for teachers, e.g. through ICT and computers; the impact of modern energy on enrolment.

Participant	Indicators
TEACHER	▸ No° of hours spent teaching ▸ No° of hours spent doing out of hours coaching ▸ Proportion of pupils time spent using ICT ▸ Number of units of teaching materials vs. number of pupils (text book/pupil ratio) ▸ Effects on levels on enrolment ▸ Qualifications/years experience ▸ Length of school Day – girls/boys ▸ Hours of study out of core school hours – girls/boys

4.2.3 The indicators reflected under Community below are designed to highlight the hours of study pupils undergo at home in an energised/non-energised community, and seeks to understand the different impact on boys and girls.

COMMUNITY	▸ Hours of children's study at home – boys/girls ▸ Hours of watching TV – per night boys/girls ▸ Hours of listening to radio – boys/girls

4.3 Qualitative Indicators

The qualitative indicators to be tested respond to a growing body of research that is changing the way poverty is conceptualised and measured that goes beyond single-indicator economic measures in order to highlight the multidimensional aspects of poverty. Use of participatory qualitative research techniques and methods will enable the poor to participate in the design of relevant indicators without bias being filtered through the lenses of external experts.

The qualitative research assumes a participatory approach and is useful for encouraging Researchers teams to explore key issues that emerge across countries, cultures, social groupings, gender, age, occupation and other dimensions of local importance.

The qualitative tools to be used on school children will comprise flexible illustrative tools.

All the study tools provided below are designed to explore and understand the perspectives and insights of the target stakeholders and enable them to express and analyse their own realities with outsiders in a facilitating role.

Theme	**Indicators**
EXPLORING ACCESS	▸ Community understanding of access to modern energy services ▸ Perceptions of impacts on a) opportunities and b) exclusion ▸ Economic, social and educational impacts on parents/children
EXPLORING HUMAN CAPITAL IMPACTS	▸ Human benefits of modern energy services
EXPLORING SOCIAL CAPITAL IMPACTS	▸ Social benefits of modern energy services

EXPLORING IMPACT ON TEACHERS	▸ Impacts on teacher retention, teaching quality and student learning.
EXPLORING IMPACTS ON PUPILS	▸ Exploring access, quality and equity in education for pupils

4.3.1 Description of participatory tools to be used for qualitative analysis

Methods	Description	Use in this context	Groups & Purpose
TIMELINES	Profile of trends, events	Track changes – days, months, years, seasons	***Pupils***: to identify changes across a day, map out hours of education at home and at school; identify what sources of energy required to meet educational needs. ***Teachers***: track changes in use of energy services in education over particular time period (months, years) ***Community***: Track energy services uses in the home and identify reasons for use.
SOCIAL MAPPING	Identification of key social features	Identifying access to services and infrastructure	***Community***: to identify social resources and services e.g. schools and infrastructural services such as water, grids etc.
VENN DIAGRAMS	Identification of roles, responsibilities, and expectations people have concerning formal and informal institutions.	Identify institutional interactions – problem solving (i.e. cause-effect relationships)	***Community***: Identify interaction between the community and local school pre and post electrification
PREFERENCE RANKING	Pair-wise comparisons (comparing each component to the next)	Identification of access to energy services	***Community*** obtaining level of access to energy services ***Pupils:*** understanding pupil's perception of access ***Teacher:*** understanding the perceived

			benefits for teachers of access to energy services
MATRIX SCORING	Preference ranking based on defined criteria – the criteria is often identified through pair-wise ranking exercises.	Identifying key constraints or opportunities.	Teachers/Community: to assess the relative prioritisation of a single issue.

4.3.2 Additional Participatory methods

- **Semi- Structured Interviews**

A guided conversation in which only the topics are predetermined and new questions or insights arise as a result of the discussion and visualised analyses. Though SSIs appear informal and conversational, they are a well-defined and systematic activity with a set of clearly defined goals and guidelines.

- **Focus Group Discussion**

A group discussion on a specified topic wherein the participants are normally grouped into types in order to get a disaggregate view. FGDs will be useful for getting the views of all groups in the community, i.e. Female Headed Households (FHHs), Male Headed Households (MHHs), women, men, boys and girls, teachers.

- **Chronology of methods**

Some of the methods are sequenced e.g. pairwise ranking enables groups to make choices at to their preferences. These preferences can then be used in a matrix form wherein the criteria becomes the preferences from the pair-wise ranking exercise. However, how the tools are ranked will depend largely on the specific context in which they are being used and the specific analysis under the research.

5. Research Activity Framework and Process

5.1 Activity Framework

The field research methodology outlined in Section 4 must be deployed using a minimum list of research instruments and activities that are outlined below:

5.2 Community Characteristics

The methodology should be deployed in both energised and non-energised communities that reflect the characteristics outlined here:

- Energised community + energised school
- Energised community + energised school with ICT
- Non-energised community + non-energised school
- Energised school + non-energised community
- Energised school with ICT + non-energised community

- Energised community + non-energised school.

Ideally the methodology would be conducted in both delineated urban and rural communities in order to reflect the diversity of impacts, a factor that cannot be achieved by focus on a limited range and situations and locations.

• 5.3 Community Characteristics Log

Information required in the Community Characteristics table below enables researchers to make comparisons across a range of sites/communities in terms of size, demographics, environmental and social characteristics. It also supports the synergy of complex information by providing a context for the analysis of the results.

Most of the information for the community characteristics log can be sourced from historical and secondary data, though local police, energy service providers, council representatives, business persons, NGOs and Civil Society Organisations comprise the key informants.

Community	Current, historic ▪ Season ▪ Type (urban, peri-urban, rural) ▪ Population ▪ # of households ▪ Employment/Livelihood (men/women/children) ▪ Average income/per household ▪ Basic infrastructure (connections) ▪ Basic Services (clinics, etc) ▪ Permanent/Migratory ▪ Key energy services ▪ Date of energy service provision ▪ Key geographic/environmental/ethnographic features ▪ Language groups ▪ Social groups (e.g. caste, religion, ethnicity, race, tribal affiliation) ▪ Relevant history

School	▪ Location in proximity to community ▪ Catchment ▪ # of teachers ▪ # of pupils ▪ Formal teaching hours ▪ Energy services ▪ Energy uses (lighting, hygiene, production, ICT, appliances) ▪ Use of schools, other than for teaching – for pupils, others/educational; others/non-educational/community

5.4 Research Participants

A broad array of study participants are needed to reflect the rich and diverse nature of the information at both the local school and local community level. The key groups and individuals to be consulted are outlined below.

5.4.1 Community – At the community level participants must include energy providers, teachers, head teachers/principals, parents, female students, male students, female headed households, male headed households, and any local leaders and/or business professionals with knowledge of the issues.

5.4.2 School – Head Teachers or Principals, teachers (across various subjects), female and male pupils. In the context of the logical framework for the research only children aged 5-14 years are included in this analysis. The ILO defines children as "persons younger than 15 years of age. The lower age limit is based on the minimum age that a child reported an occupation and the youngest age for starting an education". Therefore, this relates to school children attending primary schools and those of primary school age who are not attending school.

5.5 Research Process Guide

5.5.1 Size of Study

The size and scope of the study will be determined by the particular country context and as a result of consultations between study practitioners and their teams. However, an even number of multiple urban and rural locations should be considered wherever possible.

5.5.2 Study Team

The study must be led by a team leader who is an experienced sociologist, anthropologist, political scientist or other social scientist. A large country study, involving research at multiple sites would require a number of

teams comprising 4 people. An ideal team would include an equal number of men and women to ensure gender issues are comprehensively covered.

5.5.2.1 **Use local research networks**. This will help to strengthen local capacity for participatory and qualitative research by hiring and training local experts where possible to conduct the studies. In addition, regional and global workshops will provide opportunities for study team leaders to network with counterparts from other countries.

5.5.3 Number of days per community

The length of time spent in a community will depend on the size and scope of the study and the locations chosen to conduct the research. A time estimate of 1 hour is envisaged for completion of the quantitative questionnaire. However, the range of consultations and participants for the qualitative survey will require greater consultation time. It is estimated that an average of 1-2 days should be spent in each community that would ideally focus on one day at the school (pre-arranged) interviewing teachers, principals and conducting visual/illustrative exercises with pupils; and, one full day in the community (possibly at a local community centre, or even the school) in order to capitalise on interviewing people across the whole day – from the start to the end of the working day

5.5.3.1 **Share study findings and site reports with participating communities.** In addition, the final report should be available to local public, private and civil society leaders. This form of communication will raise awareness and help to build partnerships for future activities.

5.5.3 Training

The research team conducting the qualitative survey should be thoroughly trained in the use of participatory methods, with particular focus or adaptation of the ones outlined under this research. Training should take no less than one week and include a pilot field test that explores the purpose, themes and methods to be used in the 'live' studies. This will ensure a common understanding amongst the team of how to use the methods appropriately.

5.6 Comparative Analysis Framework

The Comparative Analysis Framework is the part of the process guide designed for assisting with the collection and analysis of field data for use across a range of countries/sites. This guide will support the synergy of complex information when conducted across multiple sites to enable comprehensive recording and compilation of results that express the commonalities and differences of a large study. The CAF assumes that the study design encompasses open-ended participatory and qualitative research tools.

This guide will also ensure that study teams do not loose sight of the thematic focus of the study and its replicability across al sites and reporting formats (outlined below) provided to all key field research staff.

The CAF outline below assumes that the information it provides will be supported by strong narrative analysis as well as highlighting the results that do not cut across all groups.

Examples of process tools that ensure comparative analysis of research data across numerous sites/countries. The table below represents the outline of the number of group discussions and key informant interviews held in each community. Information will include:

Outputs per community

Names of Facilitators

Field work dates

Number of groups/individuals met, as per the following tables

Site Name ……. Number of groups met ……..

Table 1: Number of people/groups interviewed per site

Poor					Other (specify)			Total
Men	W'men	Ch'dren	Teachers				subtotal	

Ranking access to energy services

Table 2: Ranking of access to energy services by different groups

Energy Service Access	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
	2	2	3	1			
	4	2	1	3			

Table 3: Ranking of criteria for evaluating access to energy services

Criteria	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
	2	2	3	1			
	4	2	1	3			

5.7 Site Reports

The site reports include detailed descriptions of what men, women and children said, using their own words, stories, proverbs and local terminology with explanations and diagrams. Information from men and women should be disaggregated. Teams should provide feedback to the community either before leaving or at a later date, preferably with a brief report in the local language.

Appendix E2.2
Guidance for the Qualitative Questionnaire

2. The qualitative research objectives set out below are intended as guides on the broad range of potential impacts of energy on education and poverty and are not to be seen as definitive questions to be raised in every consultation context. The questions are a guide for experienced facilitators and not for non-professionals.

3. In all cases it is necessary to assess how people define the themes and issues you are addressing in the research. This will require a listing of those definitions that may differ across communities, regions, urban and rural locations.

4. The questions raised and the methods/tools to be used in the qualitative research objectives form set out over the page, acts as a guide for an experienced Researcher, who is expected to adapt the tools and topics to suit the specific research context.

5. Children will provide qualitative information that is illustrative and guided. Visualisations often contain large amounts of valuable information in a concentrated form that is easy to comprehend, even by non-literate people. Diagrams also reveal interesting insights into the illustrator – why do they draw one thing and not another, emphasise one thing and not another? However, illustrations provide indicators only and "probing the illustration" is also necessary.

Themes and Issues	Methods	Interviewees
1. EXPLORING ACCESS	FGD, Raking, Matrix Scoring Causal impact analysis	Women, Men, FHH, MHH, Key informants

1.1 What do community members understand access to modern energy services to mean?

Different groups in the community may understand access differently. Reflect their views of what access means to them, and if possible, what it may mean to other groups within the community. This enables triangulation of results. All these differences must be recorded.

List the results under appropriate headings. These headings will emerge from the research findings.

1.2 How do community members perceive access to modern energy services has impacted on opportunities and social exclusion at the community level?

a) Opportunities

-Have modern energy services created more or less opportunities within the community? How and for whom?

- *Who or which groups have benefited the most from access to modern energy services at the community level? Which groups have been unable to take advantage of opportunities or have been negatively affected by energy service provision? Why?*

-Has provision of modern energy services enabled any in the community to move out of poverty? Who and how?

b) Exclusion

-Are there some groups in the community that are excluded from the benefits that modern energy services provide? Who are these groups and why are they excluded?

-What are the various levels of impact, if any, that exclusion has had on these groups/individuals?

-Do you have any examples of those in your community that have suffered exclusion since energy services were made available in the community? If yes, how and why?

-What power structures and differences are created between those with and those without access to modern energy services in the community?

1.3 What are the economic, social and educational impacts of modern energy services in community primary schools on parents and their children?

a) Economic

-How have the costs of school fees changed since the local primary school has been energised? What are the ways in which primary energisation has made it easier/more difficult to send children to school? Why? How much were the school fees (up to 4 years prior) before energisation? What additional costs do you have since the school has been energised? E.g. school lunches.

b) Social

-Do your sons/daughters attend school for longer/shorter hours since school energisation?
-Do your sons/daughters spend more/less time at school since school and/or home energisation?
-Do your sons/daughters have more/less free time since energisation? What do they do with that time?

c) Education

Do your children study more/less since school energisation? If yes/no, how much more/less do they study? Do they study at home? If yes, how many hours/time do they spend studying? Do they have more free time at home since energisation? Have your sons/daughters attained greater educational achievements post energisation? Provide some examples of the types of achievements.
What access do parents have to community schools since energisation? Do schools provide evening courses for adults since energisation? In what ways are computer and internet services accessible to parents? If parents have access to the internet/computers, what do they use it for? Are there any courses directed at parents at local schools since energisation? If yes, what types of courses and what is the level of attendance?

2. Exploring Human Capital	Methods	Interviewees

This section explores the human benefits of modern energy on a community and the benefits explored are considered intangible such as lighting, heating, cooling. The cost of development of human capital or human capacity and assets. Potential headings include – production, services, access to information.

-What modern energy services do you have in your home? – (lighting, entertainment, appliances, e.g. refrigeration, labour saving domestic devices/appliances?) How do you use energy in your home? In what ways do you restrict your energy use? In what ways do you restrict the energy use of your children? How do your children use modern energy services in the home? Do your children study using electric/other lighting? If yes, for how many hours per night/week?

What programmes do your children watch on TV? How many hours per night do your sons/daughters watch TV/listen to the radio?

What are the postive/negative impacts of lighting, heating appliances on a) domestic output; b) knowledge; c) production; d) income; e) health?

3. Exploring Social Capital	Methods	Interviewees

Social capital refers to the residual stocks and shares in the community that

- *How do people define social cohesion (list)?*

- *Has there been more or less social unity and sense of belonging since energisation?*

- *Has energisation caused conflicts and tensions between the various groups in the community? Which groups? Why?*

- *Are three greater or lesser number of community groups since energisation? Are there a greater or lesser number of physical outlets available to the community since energisation? What are they? What energy components do they require to function? What positive impacts has access to modern energy services created for the community?*

4. Exploring impacts of modern energy services on Teacher	Methods & Tools
Examining impacts on teacher retention rates, teaching quality, student learning. ***Retention*** *-What energy services are provided in teachers accommodation? (e.g. lighting, appliances); In what ways this affect the length of time teachers spend in service at a particular community school? What types of activities are teachers involved in after school that use the energy services provided in their accommodation? What are the differences in impact on retention rates of teachers residing in rural and urban locations with access to energy services?* ***Quality of Teaching*** - *How is teachers knowledge of computers and ICTs reflected in changes in the traditional curriculum menu? What are the ways in which teachers greater knowledge of computers and the internet reflected in the way they teach? What formal training do teachers have on the use of computers and internet access? (find out what programmes are used; training colleges attended etc). How is this training reflected in the teaching materials used? How do teachers use computers and ICTs socially and professionally?* ***Impact on student learning*** - *What are the noticeable impacts of modern energy services on boys and girls in the local community? What do teachers believe is the impact of modern energy services in schools on enrolment, retention rates of male and female pupils? – reflection of changes with regard to gender, cultural practices, labour arrangements should be made.* - *How have modern energy services impacted on the use of school facilities - i.e. sanitary, productive use? What is the effect of energy provision in schools on the community as a whole?*	FGDs SSIs

Exploring benefits to pupils	**Methods & Tools**
Exploring access, quality and equity in education for pupils *Establishing pupils levels of access to modern energy services in schools and their level of knowledge and use of those services.* *Computers, ICT, Internet* *Which appliances/services help with learning and why? Which appliances/services make pupils want to attend school? why?* ***Gender*** *How differently do boys and girls use the services and appliances at school?* *What appliances/services do boys and girls use at home? And how does use of them differ?* ***General*** *What forms of energy do children require to do home study and how does this differ between boys and girls?* *In what ways does access to energy services in the home inhibit study?* *Examine issues surrounding entertainment, TV, chores, employment. What types of TV programmes are watched for educational purposes?*	Buzz Sessions Pictorial Analysis Sorting and Pair wise Ranking

Appendix E2.3
Original Quantitative Education Questionnaire

This questionnaire represents the pre-workshop situation and has been reproduced in full here to provide a generic framework that can be used as a guide for future education-energy-poverty assessments. The revised questionnaire incorporating the Ugandan specific context is provided in Appendix E2.4.

PART I: For completion by Head Teachers/School Administrators

Energy and Access					
When did the school get access to energy services	**2000**	**2001**	**2002**	**2003**	
What types of energy services are provided?	**Elec**	**Paraffin**	**LPG (gas)**	**Coal**	**Other**
What is the yearly spending on energy services for the school?	**2000**	**2001**	**2002**	**2003**	
What are the annual school fees for pupils?	**2000**	**2001**	**2002**	**2003**	
What were the annual school fees for pupils prior to 2000	*Please provide response here:*				
What services has the provision of energy services enabled that the school did not have access to before?	*Please provide response here:*				
What percentage of the annual budget is spent on maintenance of ICTs and appliances?	**2000**	**2001**	**2002**	**2003**	

Effects of Energy on Teaching and Learning						
What percentage of the annual school budget is spent on traditional teaching materials?	**2000**	**2001**	**2002**	**2003**		
Has this percentage increased or decreased since energisation to your school? If yes by what percentage?	***Yes***	***No***	**<25%**	**>50%**	**>75%**	**>90%**
How many teachers in your school are trained in the use of: a) computers b) internet applications	**Computers**		**Internet applications**			
What percentage of the annual school budget is spent on non-traditional teaching materials?	**2000**	**2001**	**2002**	**2003**		

QUALITATIVE RESEARCH IN SUPPORT OF QUESTIONNAIRE
Are any of the changes in the curriculum menu, or subject changes, as a result of having/not having access to computers and/or the internet? If yes, how are these changes reflected across the core subjects taught at the school?
How many of the teaching materials used reflect the use of new technologies?
Do the fee rates reflect the cost of energy service provisions to the school, or does the fee rate reflect other changes?
Have literacy rates of school children improved since energy access was enabled? How is this reflected in terms of gender?

PART 2:	Primary School Teachers
Qualifications	
Years of Experience	

Changes in teaching methods and tools				
What core subjects have been modified over the last four years?	1	2	3	4

Do you have any formal training in the use of computers and/or internet applications? If yes, please list the packages you were taught and the duration of the training.	YES	NO	*List Packages:* ……. …….

How many hours per week have your spent teaching over the last four years?	2000	2001	2002	2003

How many hours per week do you spend doing coaching/teaching beyond the core school hours?	2000	2001	2002	2003

What are the number of units of teaching materials versus the number of pupils (text book/pupil ratio?	2000	2001	2002	2003

Teacher Retention		
How long have you worked for the school?	*Years:*	
Please list the energy services provided by the school for your accommodation – e.g. lighting.	*List energy services, if any, here*:	
Please list how you use these energy services – e.g. reading, preparing lessons.	*List use of energy services, if any, here*:	
Please list the appliances you have in your accommodation a) provided by school b) yourself	**Provided by school**	**Teacher's own**

How many hours per week do you spend on administrative duties for the school?	2000	2001	2003	2004

Educational Attainment of Pupils				
What is the average length of the school day in hours for boys and girls over the last four years?	2000	2001	2002	2003

What proportion of male and female pupils take additional classes out of core school hours over the last four years? *Please circle the relevant box.*	**Boys**				**Girls**			
	2000	**2001**	**2002**	**2003**	**2000**	**2001**	**2002**	**2003**
	25%	50%	75&	100%	25%	50%	75&	100%
What is the percentage increase/decrease in pass rate exam results over the last four years between boys and girls. *Please circle the relevant box.*	**Boys**				**Girls**			
	2000	**2001**	**2002**	**2003**	**2000**	**2001**	**2002**	**2003**
	25%	50%	75&	100%	25%	50%	75&	100%

Computer and Internet Knowledge	
How many computers does the school have?	
How many of the computers are used solely for administrative purposes?	
How many of the computers are used by pupils?	
How many of the computers are linked to the internet?	
How many hours do you spent on the computer/internet per week?	
How many hours per week do the pupils spend on the computers and/or internet?	
At what age are pupils at the school permitted use of the computers and/or internet applications?	

Extra Curricular Activities	
Does your school provide classes for adults residing in the community outside school hours?	*Please write answer here, with any additional notes.*
What subjects do adults residing in the community enrol for at the local school?	*List subjects below:*

QUALITATIVE RESEARCH IN SUPPORT OF QUESTIONNAIRE
What were the teacher retention rates prior to energy services being provided to the school?
How many of the teaching materials used reflect the use of new technologies?

What are the ways in which energy service provision in schools has increased a) access and b) educational achievement, of adults in the community?
What are the ways in which boys and girls benefit from energy service provision in the community school? Please reflect the differences as well as the commonalities.
Are there any cost savings in the purchase of materials (e.g. text books) with the use of energy services in the school?
Have the modified subjects been altered due to the availability of specific energy services? If yes, what energy services?
Is there a difference in the academic achievement of boys and girls? Where possible, provide reasons for this. *Energised school: Have girls enrolment rates improved since energy services were provided to the school? In what way? What are the clear benefits?*
Do the changes in teaching hours over the last four years reflect the use of new technologies? Do new technologies increase or reduce the number of hours spent preparing lessons?

PART 3: For completion by Community	
Interviewees	Parent, MHH, FHH, vulnerable groups

Benefits of Energy Services / Children								
How many hours per night do your children study at home?	**Boys**				**Girls**			
How many hours per night do your children spend watching TV or listening to the radio?	**Boys**				**Girls**			
	TV		**Radio**		**TV**		**Radio**	

Benefits of Energy Services / Parents				
Do you currently attend evening classes at your local community school? If yes, in what subjects?	**YES**	**NO**	*Subjects:*	
When did the school first provide classes for adults residing in the community?	**2000**	**2001**	**2002**	**2003**
Has the school provided you, or others in your community with training in the use of computers and/or internet applications? If yes, please list the packages you were taught and the duration of the training.	**YES**	**NO**	*List Packages:* ……. ……. ……..	
How much have school fees increased/decreased over the last four years?	**2000**	**2001**	**2002**	**2003**

QUALITATIVE RESEARCH IN SUPPORT OF QUESTIONNAIRE

Energised Schools: What difference has energy service provision at the school made to the educational accomplishments of your child(ren)? Do you see a difference in attainment levels between boys and girls? Why?

Energised communities: Has access to energy services at the community level increased or reduced the time your normally spend on daily productive activities?

If it has reduced the time spent – has this resulted in you having more free time for yourself of is that free time transferred to other productive activities?

Does access to energy services reduce or lengthen your normal working day? In what ways?

Has having energy services in the home increased your ability to improve your income? How?

Appendix E2.4
Revised Quantitative Education Questionnaire

This questionnaire was revised following the pilot field testing and peer review workshop in Uganda. It is tailored specifically to the Ugandan context.

Makarere Institute, Uganda
Voice International, Uganda
Alison Bannister, Future Energy Solutions

PART 1: For completion by Researchers

Some of the questions from the Community Characteristics log have been moved to this questionnaire to ensure that the researchers gather all information required to place the school in context within the bigger study, prior to making the visit to the school.

This information enables researchers to make comparisons across a range of sites/ communities in terms of size/ demographics, environmental and social characteristics. It also supports the synergy of complex information by providing a context for the analysis of the results.

Much of this information can be found from sources such as libraries, census data and informants such as council representatives, local police, energy providers, business persons, NGOs, etc. Therefore researchers should try to collect as much of the information as possible prior to visiting the school.

Background Information on the school		
1	Is the school private or government funded	*New question*
2	Is it day or boarder	*New question*
3	Is it mixed or single sex	
4	Is it situated in an urban, peri-urban or rural area	
5	Obtain accounts for school over the last 4 years if possible	

Background Information on the community where the school is based (using census information where possible)		
1	What type of community is it (urban, peri-urban, rural)	
2	What is the population	
3	How many households (define the community using the census categories)	
4	Top 3 types of productive	

	activities					
5	Average income per household					
6	What is the dominant social group and what are the key characteristics of this group					
7	What are the main language groups					
8	How long has the community been here	*New question*				
9	Are there regular newcomers or is the community permanent	*Refined question*				
10	What is the basic infrastructure (water, roads, phone) like	Describe				
11	What are the basic services (clinics, libraries, schools, recreation facilities, etc.)	Describe				
12	What energy types does the community have and what does it use this energy for *(refined question)*	**Energy source**	**Used for**			
		Fuelwood				
		Charcoal				
		Biomass				
		Batteries				
		Diesel (generators)				
		Kerosene				
		Cylinder gas				
		Electricity - grid				
		Electricity – solar				
		Electricity – hydro				
		Electricity – biogas				
		Other				
13	If the households in the community has electricity, when was this first provided and in what form, and how many houses have it	Generator	Grid	Biogas	Hydro	Solar

Background Information on education in the country (from relevant sources e.g. ministries)		
1	Who is responsible for education in primary schools	
2	What performance statistics are measure, how up to date are these and how are they collected	
3	Have there been any changes to the curriculum in the last four years	
4	Does these change incorporate energy directly or energy indirectly through new technologies	
5	How are schools without energy overcoming this shortcoming	
6	Have teacher training approaches changed as a result of incorporating energy into the curriculum	

PART 2: For completion with Head Teachers/ School Administrators

A background section has been introduced in order to allow the researchers to 'break the ice' with the head teacher and familiarise themselves with the situation of the school. It also ensures that general questions can be asked both of energised and non-energised schools as energy related questions have been separated out.

Name of interviewee:	
Sex:	
Age:	

Background Information (all schools)											
1	When did the school first open ?	*New question*									
2	Is the catchment area for the pupils local, district, regional, country or beyond	*Refined question*									
3	How long have you been working here (as both teacher and head)	*New question*									
4	How many teachers are there at the school	Men teachers					Women teachers				
5	Where do the teachers live	School accommodation (number)					Community accommodation (number)				
6	How many pupils by age	4	5	6	7	8	9	10	11	12	13
7	How many pupils are boys										
8	How many pupils are girls										
9	How many support staff (cooks, cleaners, security, drivers, maintenance)	*New question* Men support staff					Female support staff				
10	How many weeks are there in the school year										

Moved from primary school section

Teacher recruitment and management (retention) (all schools)						
1	How many of the current teachers have spent the following periods of time at the school	<1 year	>1 and <2 years	>2 and <5 years	>5 and <10 years	>10 years
	Male					
	Female					

New section developed from trial experience

Reasons for Teacher Retention (all schools)	
What do you believe to be the most important factors influencing teacher recruitment and retention ? Please rank (1= most important; 10 = least important)	
Salary	
Accommodation for living	

Teaching facilities	
Transport (good roads, buses, matatus)	
Clean water	
Communication networks	
Location (proximity to centres/ facilities)	
Electricity	
Good administration	
Supportive parents	
Other examples to be developed	

Moved from primary teacher section and absolute figures requested rather than percentage changes. This is a very contentious section that needs more work as difficult to capture the huge number of reasons/ variable factors and therefore might need to be aligned with the country methodology for determining drop out and attainment.

Educational Attainment (all schools)						
1	What are the annual school fees for the pupils and how is this broken down (e.g schools, uniform, water, food)	2000	2001	2002	2003	
2	How many hours do the children have taught lessons (weekly)		2000	2001	2002	2003
		Boys				
		Girls				
3	How many hours do the children have supervised self-study (weekly)		2000	2001	2002	2003
		Boys				
		Girls				
4	How many children take additional classes outside core teaching (weekly)		2000	2001	2002	2003
		Boys				
		Girls				
5	How many children have completed primary education as a percentage of those who started each year		2000	2001	2002	2003
		Boys				
		Girls				
6	How many children have achieved the highest grade as a percentage of the children taking the leavers exam that year		2000	2001	2002	2003
		Boys				
		Girls				

New section developed from trial experience

Reasons for Educational Attainment (all schools)	
What do you believe to be the most important factors influencing education attainment ? Please rank (1= most important; 10 = least important)	
Childs basic ability	
The school is able to select the best pupils	
Supportive parents	
Teachers qualifications	
Teachers experience	
Teachers motivation	
Text book/ ratio	
Quality of text books available	
Classroom size (teacher/pupil ratio)	
Learning aids (demonstrations, equipment, field trips)	
School management style	
Teaching style	
Physical condition	
Computers in the classroom	
Other examples to be developed	

This may be more relevant for the Ministry to answer

Curriculum changes(for all schools)		
1	Have the core subjects changed or been modified over the last 4 years ?	(Describe the changes)
2	Have the changes introduced energy directly or new technologies that require energy in the subject materials (e.g. use of the internet)	(What) *(Qualitative)*
3	Have the changes required teaching methods and tools to change (e.g. more practical training ?) that requires energy	(How) *(Qualitative)*

Connection with local community (all schools)		
1	Is the school used for other activities outside formal teaching e.g. for teaching adults, for community activities	Please give details
2	If yes, how many hours	

	is the school premises used for these purposes	
3	Is energy required for these activities	
4	Why	

Energy Information (all schools)						
1	How much does a school spend in total in a year		2000	2001	2002	2003
2	What are the three biggest expenditure items and how much is spent in a year		2000	2001	2002	2003
3	What types of energy does the school use and what does it use this energy for *(refined question)*	Energy source	Used for			
		Fuelwood				
		Charcoal				
		Batteries				
		Diesel (generator)				
		Kerosene				
		Bottled gas				
		Electricity - hydro				
		Electricity - solar				
		Electricity - biogas				
		Electricity –grid				
		Other				
3	How much does the school spend on energy in a year	Energy source	2000	2001	2002	2003
		Fuelwood				
		Charcoal				
		Batteries				
		Diesel				
		Kerosene				
		Bottled gas				
		Electricity				
		Other				

MODERN ENERGY USE (For schools that have NOT been energised)			
1	Why is the school not energised with modern energy e.g. electricicity	(e.g. cost, access)	
2	State how you think that modern energy could improve the performance at your school by either strongly agreeing (4), agreeing (3), disagreeing (2) or strongly disagreeing (1) with the following questions		
	Administration would be easier leaving more time for teaching		
	Lesson times could be extended, ensuring that pupils have more time to study		
	The quality of teaching would improve because of better teaching materials		
	The increased cost of electricity would reduce the amount available for core activities e.g. teacher salaries		
	The school would earn income from renting out the premises during the evenings for meetings, classes		
	The school would improve its status in the community by providing facilities to the community		
	The school can raise additional income from providing services (such as report writing, photocopying, phone charging)		
	Lesson preparation could be done in the evenings leaving more time for teaching during the day		
	Examinations papers could be photocopied more cheaply and easily and distributed to students to help with their study		
	Children would be able to do their homework at school in the evenings		
	It is cheaper to buy photocopying and printing services from the shops than having the equipment and maintaining it yourself		
	Equipment that requires energy is very expensive and will not pay for itself		
	If energy is available, we could expose child to computers and TV and this would help children to have more ambition		
	(include more examples)		

MODERN ENERGY USE (e.g. For schools that have electricity)

1	If the school is electrified what year did this occur ?		
2	Are electricity connections for both the school and accommodation of teachers ?	*New question* Please circle School only/ Accommodation only/ Both	
3	What services are now available that where not prior to the provision of modern energy services and what are they used for (accounts, report writing, letters, etc.)	*Refined question*	
		Service	**Used for**
		Computer	
		Printer	
		Photocopier	
		Other	
4	How did the school did access these services prior to modern energy	*New question*	
5	How has these service improved your administration	How *Qualitative*	
	Have there been any time or cost savings in administration ?	How much	
	What has been done with the additional time/ savings in administration	*Qualitative*	
	How has these service improved your teaching	How *Qualitative*	
	Have there been any time or cost savings in teaching ?	How much	
	What has been done with the additional time/ savings in teaching	*Qualitative*	
	How has service improved your educational attainment	How *Qualitative*	

COMPUTERS AND INTERNET KNOWLEDGE (For schools that have computers)

1	When did the school obtain computers				
2	How many computers does the school have				
3	How many of the computers are linked to the internet				
4	How many administration, teachers and pupils have been trained in the use of computers and the internet		Computers	Internet	
		Admin			
		Teachers			
		Pupils			
5	How many of the computers are in working order and used by each group		Computers	Internet	
		Admin			
		Teachers			
		Pupils			
6	At what age are the pupils allowed to use the computers				
7	How many hours are the computer used	By administration	By teachers	By pupils	
8	What do they use the computers for ? (e.g. letter, accounts, report writing, homework, lesson planning, research, etc.)	Admin	Teachers	Pupil	
9	What percentage of the budget is spent on maintaining and running computers and related appliances (e.g. printers, scanners, etc.)	2000	2001	2002	2003
10	What percentage of the teaching budget is spent on teaching material that depend on new technologies such as computers, printers, photocopiers	2000	2001	2002	2003

11	What percentage of your teaching budget is spent on traditional teaching materials (need to give examples) i.e. chalk	2000	2001	2002	2003
12	What is the percentage change of money spent on traditional materials since the school got modern energy				

Qualitative research questions
Are any of the changes in the curriculum menu, or subject changes, as a result of having/ not having access to computers and/or the internet. If yes, how are these changes reflected across the core subjects taught at the school ?
How many of the teaching materials used reflect the use of new technologies ?
Do the fee rates reflect the cost of energy service provision to the school or does the fee rate reflect other changes ?
Have the literacy rates of school children improved since energy access was enabled ? How is this reflected in terms of gender ?
What were teacher retention rates prior to energy services being provided to the school ?
What are the ways in which energy service provision in schools has increased a). access and b) educational attainment of adults in the community ?

What are the ways in which boys and girls benefit from energy service provision in the community school ? Please reflect the differences as well as the commonalities.
Are there any cost savings in the purchase of materials (e.g. text books) with the use of energy services in the school ?
Have the modified subjects been altered due to the availability of specific energy services ? If yes, what energy services ?

PART 3: For completion with Primary School Teachers

A background section has been introduced in order to allow the researchers to 'break the ice' with the teacher and familiarise themselves with their situation. It also ensures that general questions can be asked both of energised and non-energised schools as energy related questions have been separated out.

Name of interviewee	
Sex	
Date and time of interview	

Background (all schools)		
1	What are your qualifications	
2	How long have you been teaching in total (in years)	
3	How long have you been teaching here (in years)	

4	What do you teach (year group and subject)				
5	What are your weekly teaching hours (on average)	2000	2001	2002	2003
6	How many hours do you spend on extra tuition for your pupils (per week)	2000	2001	2002	2003
7	How time do you spend on other teaching related work (e.g. lesson planning, marking, examination setting, supervision)	2000	2001	2002	2003
8	How many hours do you spend on other administration e.g. on duty, discipline, generator management, staff recruitment, etc.(per week)	2000	2001	2002	2003
9	Do you teach outside the school (e.g. adult literacy ? and how many hours per week				

Teachers Accommodation (all teachers)			
1	What energy do you use in your accommodation and what do you use it for	Energy type	Use
		Firewood	
		Charcoal	
		Batteries	
		Kerosene	
		Bottled gas	
		Electricity	
		Other	
2	Is it school provided accommodation		
3	If school provided accommodation, does the school provide each type of energy for free, subsidised or full cost		

4	If the school provides electricity list the appliances you have in your accommodation that require electricity and indicate whether they are provided by the school			
		Appliance	School ?	Own ?
		Fridge		
		Electric Cooker/ Stove		
		Iron		
		Modern lighting		
		TV		
		Computer		
		(Add more here)		

New section developed from trial experience

Reasons for Teacher Retention (all schools)	
What do you believe to be the most important factors influencing teacher recruitment and retention ? Please rank (1= most important; 10 = least important)	
Salary	
Accommodation for living	
Teaching facilities	
Transport (good roads, buses, matatus)	
Clean water	
Communication networks	
Location (proximity to centres/ facilities)	
Electricity	
Good administration	
Supportive parents	
Other examples to be developed	

Energy and Educational Attainment (for teachers with access to electricity and appliances)				
1	List the appliances used for your school related work (e.g. computers, lighting, TV), what they are used for and the benefits	Appliance	Used for	Benefit
2	How has access to these appliances (that require modern energy) improved the performance at your school. Either strongly agreeing (4), agreeing (3), disagreeing (2) or strongly disagreeing (1) with the following questions			
	Administration is quicker and easier leaving more time for teaching			
	Lesson preparation is done in the evenings leaving more time for teaching during the day			
	Examinations papers are photocopied and distributed to students to help with their study			

	I can find out supporting information more quickly	
	I can make my lessons more relevant and interesting	
	(include more examples)	

Qualitative Questions
How many of the teaching materials reflect the use of new technologies (what are 'new technologies' ?
Have the modified subjects been altered due to the availability of specific energy services ?
Is there a difference in the academic achievement of boys and girls ? Where possible provide reasons for this.
Energised schools (what does this mean): Have girls enrolment rates improved since energy services were provided to the school ? In what way ? What are the clear benefits ?
Do the changes in teaching hours over the last four years reflect the use of new technologies ? Do new technologies increase or decrease the number of hours spent preparing lessons ?

PART 4: For completion with Parents/ Guardians

A background section has been introduced in order to allow the researchers to 'break the ice' with the parent/ guardian and familiarise themselves with their situation. It also ensures that general questions can be asked both of energised and non-energised schools as energy related questions have been separated out.

Name of interviewee	
Status (e.g. female headed, male headed household)	
Date and time of interview	

Background (all parents/ guardians)										
1	Are you a guardian or parent									
2	How many children are you responsible for; what are their ages and sex		1	2	3	4	5	6	7	8
		Age								
		Sex								
		In school								

Energy usage (all parents/ guardians)			
1	What types of energy do you use in the home and what is it used for *(refined question)*	Energy source	Used for
		Fuelwood	
		Charcoal	
		Batteries	
		Diesel	
		Kerosene	
		Bottled gas	
		Electricity	
		Other	

Educational Attainment of Children								
1	How many hours do your children study at home	M	T	W	Th	F	S	Su
2	What do they use for light ?							
3	Do you have a TV							
4	If yes, how many hours do your children watch TV	M	T	W	Th	F	S	Su

5	Do you have a radio							
6	If yes, how many hours do your children listen to the radio	M	T	W	Th	F	S	Su

MODERN ENERGY USE (For homes that have NOT got electricity)		
1	Why is the home not got electricity	(e.g. cost, access)
2	State how you think that modern energy could improve your home by either strongly agreeing (4), agreeing (3), disagreeing (2) or strongly disagreeing (1) with the following questions	
	Time saved on household chores such as cooking and cleaning could be used for studying	
	Children could study more in the evenings	
	Children would study more in the evenings	
	(include more examples)	

MODERN ENERGY USE (For homes that have been electrified)		
1	If the home is electrified what year did this occur ?	
2	How has electrification improved your home life	How *Qualitative*
3	Have there been any time or cost savings ?	How much
4	What has been done with the additional time/ savings	*Qualitative*
5	Has the provision of modern energy increased the amount of time your children study and by how much	

Qualitative Questions
Energised schools (define): What difference has energy service provision at the school made to the educational accomplishment of your child(ren) ? Do you see a difference in attainment levels between boys and girls ? Why ?

Energised communities: Has access to energy services at the community level increased or reduced the time you normally spend on daily productive and household-related activities
If it has reduced the amount of time spent – has this resulted in you having more free time for yourself or is that time transferred to other household-related or productive activities
Does access to energy services reduce or lengthen your normal working day ? In what ways ?
Has having energy services in the home increased your ability to improve your income ? How ?