

“Energy Access” Working Group
Global Network on Energy for Sustainable Development

Final Synthesis/Compilation Report

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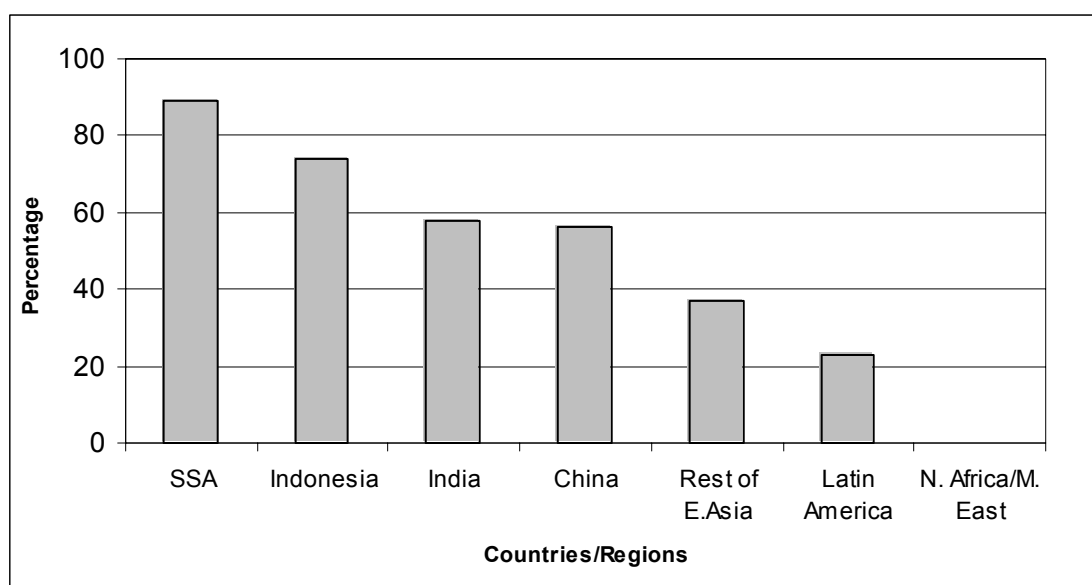
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Part I – Introduction

1.1 Background on the Status of Poverty and Energy Access

About 2.7 billion people or close to half of the world’s population is estimated to survive on less than US\$2.00 per day¹– the “poor” as defined by international agencies such as the World Bank, IEA, UNDP, UNEP and OECD (Ravallion, 2004). A key distinguishing feature of the world’s poor is inadequate access to cleaner energy services (figure 1). The majority of those earning less than US\$ 2.00 per day (an estimated 2.4 billion people) rely on traditional biofuels to meet the bulk of their energy needs (GNESD, 2003a; WEC, undated).

Figure 1 Proportion of Population Relying on Biomass for Cooking and Heating (2000)



Source: IEA, 2002; Overend and Craig, undated; Best and Christensen, undated

Furthermore, an estimated 57% of the world’s poor (about 1.6 billion people) do not have access to electricity (table 1) and a significant portion have limited or no access to cleaner and more modern fuels such as kerosene, LPG and natural gas.

¹ For some countries, US\$2.00 per day may represent a relatively high income. For example, in Argentina, a family that currently receives US\$240 per month (based on 4 persons each receiving US\$2.00/day) is not a poor family (Bouille, 2002). This is also true of many sub-Saharan African countries where well over 90% of the population survives on less than US\$2/day.

It is important to note that there is an emerging debate on the validity of the method used to estimate the poverty threshold by the World Bank and other international agencies (i.e. using household surveys). Critiques of this technique claim that the poverty levels it depicts appear to be higher than likely reality and they suggest the use of national accounts data as a more appropriate method of estimating poverty levels.

Table 1 Urban and Rural Electrification Levels by Region, 2000

	Urban (%)	Rural (%)	National (%)
Developing Countries	85.6	51.1	64.2
Middle East	98.5	76.6	91.1
East Asia/China	98.5	81.0	86.9
Latin America	98.0	52.4	86.6
World	91.2	56.9	72.8
South Asia	68.2	30.1	40.8
Africa	63.1	16.9	34.3

Source: IEA, 2002; GNESD, 2003a; World Bank, 2003; EDF Group, 2002.

The poor in developing countries face, inter alia, three key energy challenges:

- Reliance on biofuels that harm human health and the environment.
- Inadequate access to cleaner energy services, such as electricity, for productive purposes and institutional applications.
- Incomes that are too low (as well as limited access to appropriate financing schemes) to allow the poor to procure cleaner and more sustainable energy services, such as electricity, that are more expensive².

In the last two decades, developing countries have implemented a wide range of energy sector reform initiatives, which were expected to, inter alia, address some of the above concerns. Initial indications from a wide range of developing countries, however, seem to indicate that few of these reform initiatives have resulted in significant improvement in the provision of cleaner energy services to the world's poor.

What is particularly worrisome about the above challenges is the deterioration in some countries in quality and reliability of energy services available to the poor in spite of numerous energy reform initiatives. This is particularly true in sub-Saharan Africa (and parts of Latin America & the Caribbean, Middle East and South Asia) where reliance on traditional biofuels is increasing and the proportion³ of unelectrified people continues to grow.

Some analysts contend that far from reducing energy poverty, reforms may have increased energy poverty in parts of the developing world (Wamukonya, 2003; Lash, 2002; Bouille, Dubrovsky & Maurer, 2002; Dubash & Rajan, 2002). The analysts argue that from the onset, energy reforms were not designed to address the energy problems of the poor but were explicitly aimed at improving financial and technical efficiency of utilities, facilitating divestiture and guaranteeing future energy supply in

² Up-front costs of associated devices and appliances for cleaner and renewable energy options are often prohibitive for the poor.

³ In other words, although the absolute number of people with electricity is increasing, the rate of electrification is outpaced by population growth (Radka, 2002). This is especially true of many sub-Saharan African countries where electrification rates are below population growth rates.

an open globalized energy market (Wamukonya, 2003; Byrne & Mun, 2003; Fall & Wamukonya, 2003; Agbemabiase, Byrne & Bouille, 2003; Lash, 2002; Bouille, Dubrovsky & Maurer, 2002; Dubash & Rajan, 2002; Edjekumhene & Dubash, 2002).

To better understand the aforementioned poverty – energy sector reforms nexus, an “Energy Access” study was launched under the auspices of the Global Network on Energy for Sustainable Development (GNESD). GNESD is a post-Johannesburg Summit (2002)⁴ initiative that aims to promote sustainable development through policies and solutions that expand the poor’s access to sound energy services.

1.2 The GNESD “Energy Access” Study

Available literature reveals that, in the past, attempts have been made to study the impacts of energy sector reforms. However, most of these have focussed on the effects of reforms on the performance of power utilities and, to a limited extent, on electricity tariffs. Few studies have attempted to assess the impact of reforms on the poor or to provide empirical evidence of such impacts. The investigations of the GNESD “Energy Access” Working Group⁵ (see Appendix 1 for more details) have resulted in detailed case studies designed to address this important gap.

The primary objective of the “Access” Working Group is to examine the impact of energy sector reforms on the poor by responding to the following two key questions:

- Have previous energy policy reforms addressed the “energy access” challenge facing the poor or have the reforms actually contributed to the growing problem of inadequate energy services for the poor in the developing world?
- Based on rigorous analysis, which are the proven and robust policy options that would lead to improved, cleaner and more sustainable energy services for the poor in developing countries?

To ensure that their findings would be comparable and to facilitate making of useful recommendations, the “Energy Access” Working Group agreed on a broad common approach and on a set of indicators. This section highlights the common methodological elements adopted by the Working Group:

Sub-regional perspective: Each Centre adopted a sub-regional perspective and provided case studies of two or three countries, the rationale for selection of those countries being included in its report. Brazil and China, because of their size and unique characteristics, were treated as sub-regions.

⁴ Also commonly referred to as World Summit on Sustainable Development (WSSD)

⁵ Phase I of “Access” study involved eight (8) Centres assisted by an interim-Secretariat provisionally located at the UNEP Collaborating Centre on Energy and Environment (GNESD Secretariat) in Riso, Denmark. The Centres involved in the “Energy Access” Working Group (WG) and their respective regional coverage are listed below:

- African Energy Policy Research Network (AFREPREN/FWD) – East Africa
- Asia Institute of Technology (AIT) – South and South East Asia
- Energy and Development Research Centre (EDRC) now Energy Research Centre (ERC) – Southern Africa
- Energy Research Institute (ERI) – China
- Environnement et Developpement du Tiers Monde (ENDA-TM) – West Africa
- Federal University of Rio de Janeiro (COPPE/UFRJ) – Brazil
- Fundacion Bariloche – Latin America and the Caribbean
- The Energy and Resources Institute (TERI) – South and South East Asia

Although the best approach would have been to select one country that had more advanced reforms and another where fewer reforms had been implemented, due to data limitations, it was difficult to adopt the proposed approach. Consequently, some of the country case studies were selected because they had the best data sets available.

Focus on electricity: To narrow down the scope of the study, the “Energy Access” Working Group focussed on the electricity sub-sector. The term ‘electricity sub-sector’ took into account off-grid options (i.e. mini-grid systems & isolated units) including those generating electricity from renewables and those operated by cooperatives (Chaurey, 2003; Shrestha, 2003; Davidson, 2003).

Assessment of one reform option: Because of time limitations and the need to rely on empirical evidence, each Centre was supposed to examine the impact of one reform option of their choice. The term ‘reform’ should be understood in its wider meaning to include any major changes to the institutional structure of the electricity sector aimed at improving the poor’s access to electricity. More proactive state interventions or subsidies can also be perceived as ‘reform options’.

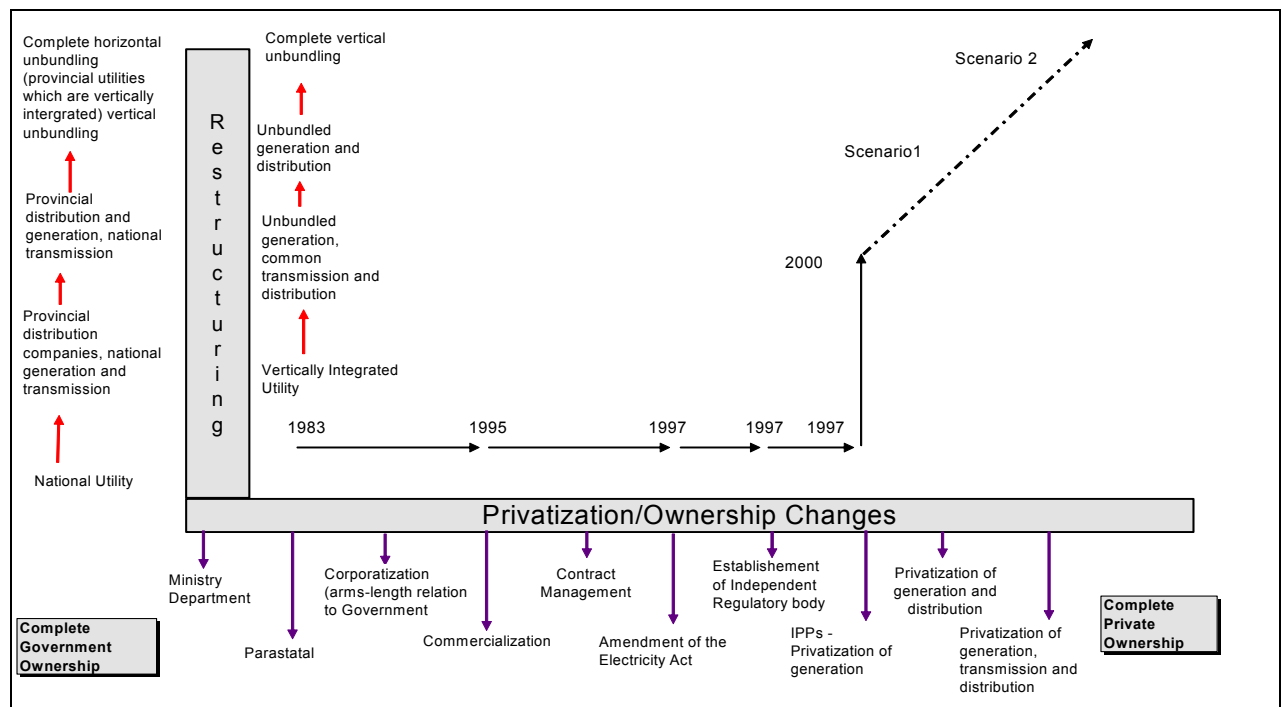
The key drawback with selection of one reform option is the difficulty of distinguishing the effects of a single reform option from others put in place, especially where several options have been effected in a short span of time (see following box). This is an intractable problem given the lack of adequate data (Bailis, 2003).

Box 1: Difficulties associated with assessing one reform option

At first glance it appears that selecting one single reform option is a wise choice. However, policy reforms are developed and implemented in many different ways. The Amendment of an Electricity Act in one country may be quite different from the same process in a different country. In addition, some countries implement a series of reforms, while others implement only one or two. In cases where more than one policy reform has been implemented in the space of a few years, it will be quite difficult to distinguish the effects of a single reform from others that have been put in place. In addition, it may be that the effects observed in a given example are actually the result of the interaction of two or more policy processes (Bailis, 2003).

To ensure a common understanding of the reform options examined in the GNESD case studies, the Working Group adopted a standard terminology to explain the various power sector reform options (see Appendix 2). An illustration of the implementation of reforms for each of the country under study was compiled (see sample below). Although each reform step is not necessarily linked to the “access” issue, the illustration provided a tool for comparing the status of reforms in each of the countries under study.

Figure 2 Sample Graph of Reform Options



Reliance on empirical evidence: As aforementioned, the “Energy Access” study was expected to provide empirical assessments of the impact of reforms on the poor. In line with the need to emphasise empirical evidence, five indicators⁶ were selected to determine the impact and effectiveness of reforms in the electricity sector. These fall into two broad categories: Access and Affordability:

Access

Three indicators were used to assess access:

National electrification levels: Providing an estimate of the proportion of the population that has physical access to electricity. This data set was mainly derived from utility reports and has a major limitation in that a common technique adopted by some utilities to estimate the proportion of the households electrified does not differentiate between domestic and non-domestic connections. Consequently, it could indicate domestic electrification levels that are higher than the correct level. Conversely, it can lead to lower electrification levels if it underestimates the numbers of persons that use a single connection - can be a figure higher than the average household size.

National electrification rate (i.e. the rate at which new connections are being made): Indicating to what extent a particular reform is accelerating (or possibly retarding) access to electricity.

⁶ It is important to note that the term ‘indicators’ as used in this paper does not mean ‘drivers’ per se. The study also recognized that the indicators could be deceiving, especially if there is no previous information about their limitations and the complexities involved in the real explanatory variable (see appendix 2).

Electricity consumption per capita⁷: This indicator can provide some pointers as to how reforms affect the poor, it is, however, also a function of other variables such as tariff and types of appliances used.

Affordability

Two indicators were used to assess affordability:

Electricity tariffs⁸: When combined with income data, tariffs can indicate to what extent various groups in society can afford electricity.

Electricity expenditure⁹: Household expenditure for electricity as a proportion of total household income can be an indicator of the burden of electricity services can place on the budgets of poorer households.

As the main focus of the study was access to electricity services by the poor, a first step was to define the “poor” and “non-poor” in this context. In most cases, this presented a challenge. While data based on international and national poverty lines are often available—making it relatively easy to see what proportion of a country's population can be classed as poor—utility companies and other organisations tend to count only total numbers of households electrified and levels of consumption. They do not distinguish between “poor” and “non-poor” consumers.

Faced with this situation, the Centres generally used proxies for the poor. For example, although power utilities do not class customers in terms of income, they nevertheless often categorise them in terms of tariff bands, corresponding to levels of consumption. Consumers in the lower bands can, therefore, be assumed to be the poorer members of society. This was the case, for example, in Senegal, where customers whose income is so low that they use electricity for lighting only, are considered as “poor”.

In other cases, the preponderance of poverty amongst rural dwellers is such that the rural population itself can be taken as a proxy for “poor”. This assumption has some limitations as it ignores the urban poor and non-poor rural households (which, in many developing countries, account for a tiny proportion of the rural population). More importantly, it fails to recognise that the majority of the rural population with access to electricity are probably not poor (Bailis, 2003).

⁷ The proxy for consumption in some cases is deceiving. For example, in Great Buenos Aires in Argentina, electricity consumption of the urban poor was around 150 kWh/month due to the use of obsolete equipment, inefficient coolers and heaters, etc (Bouille, Kozulj and Di Sbroiavacca, 2003).

⁸ Unfortunately, tariffs are often applied uniformly i.e across income groups and geographical regions – rural and urban. Hence, it becomes difficult to analyse the impact of reforms on the poor through a tariff assessment. The complexity of real reform impact on the poor is not always reflected in the pricing or tariff policy, as shown in the case of Argentina. A tariff could be reduced in nominal monetary terms, but could have negative effects on the majority of the poor due to the distorted and unfavorable exchange rate (Bouille, Kozulj and Di Sbroiavacca, 2003)

⁹ The key complication associated with this indicator is that, on its own, it may not be sufficient to assess the impact of reforms on electricity expenditure. This is because other indicators such as household energy expenditure and electricity expenditure (in absolute terms) should also be examined to isolate changes in the proportion of expenditure on electricity caused by changes in the expenditure levels of other energy sources.

Wherever possible, time series trend data was used. In the absence of such sets of data, the Centres used data year(s) just before and some time after the implementation of the selected reform option.

The next section presents summaries of key findings for the following sub-regions (or countries in the case of China and Brazil) that participated in the study:

- East Africa
- Western Africa
- Southern Africa
- South and South East Asia
- China
- Latin America and Caribbean
- Brazil

Key Findings by Each Centre

1.3.1 East Africa: Kenya and Uganda Case Studies

Poverty levels are very high in Eastern Africa¹⁰, particularly in rural areas where the majority of the poor live. Household electrification levels are very low with all countries in the sub-region (except Mauritius) having levels below 15 per cent (Karekezi, et al, 2003; Okumu, 2003; Kinuthia, 2003).

Until recently, the electricity industry in Eastern Africa was characterised by a monopoly structure dominated by vertically integrated, state-owned power utilities. The poor performance of these monopolies was a key driver for structural, legal and regulatory reforms being implemented in some parts of the sub-region.

Compared to other regions of the world, reform in the power sector in Eastern Africa has been slow. The key reforms implemented have been to let independent power producers (IPPs) enter the market. Little progress has been made in unbundling of vertically integrated state utilities and the establishment of independent regulatory agencies. The situation is summarised in the following table.

Table 2 Status of Power Sector Reforms in Eastern African Countries (2003)

Reform Measures	Mauritius	Tanzania	Kenya	Uganda
Amendment of the Electricity Act			U	U
Corporatisation/Commercialisation		U	U	U
Establishment of Independent Regulator			U	U
Restructuring (unbundling)			U	U
Independent Power Producers	U	U	U	U
Privatisation of Generation				U*
Privatisation of Distribution				?
Electrification levels (%) - 2001	100	10**	6***	4

Source: Karekezi, et al, 2003; Mugarura, 2003; Okumu, 2003; Kinuthia, 2003

Notes:

? A distribution concession was yet to be concluded by 2003

* Concession awarded to Eskom (South Africa) in 2002.

** 2002 data

*** This figure only refers to the proportion of households connected to the electricity grid and may differ significantly from other sources which indicate the proportion of electrified population derived from the total number of grid electricity customers. Important to note is that available data on electrification of the poor is inadequate - the East African research team had to compile the data from raw data provided by the utilities.

A notable feature of the aforementioned table is the almost universal access to electricity realized in Mauritius, the slowest reformer in the region. It could indicate that electrification of the poor is best effected before (or at least, at the same time when) major reforms are enacted, especially market-oriented reforms. In Kenya's case, the situation was compounded by the misallocation of rural electrification funds. The partly privatized utility simply confiscated funds meant for rural electrification and used the funds to cover operating costs. In effect, the utility confined its attention to its urban customers and largely abandoned efforts to reach the rural poor.

¹⁰ In this publication, the term Eastern Africa refers to Kenya, Uganda, Mauritius and Tanzania while East refers to Kenya and Uganda.

As the table clearly indicates, Kenya and Uganda are the countries in the sub-region that have, to date, gone furthest in restructuring their electricity sectors. Both have amended their legislation to provide a framework for unbundling and increased private sector participation. Reforms in Kenya's power sector were undertaken largely due to pressure from the donor community, which made reforms a prerequisite for development assistance to the sector.

The reforms in Kenya and Uganda appear to have been detrimental to electrification of the poor¹¹, particularly in rural areas. Findings, although not fully conclusive, appear to indicate that tariffs have increased as cross-subsidies were eroded and that, in Kenya, tariff reforms have led to the poor incurring higher costs than the non-poor. Overall, analysis shows a net decrease in electrification rates during the reform period reviewed with, in the case of Uganda, an apparent drop in rural connections (see table below). In both countries, limited initiatives aimed at increasing rural electrification appear to have started only at the end of the reform process.

Table 3 Pre and Post Reform Electrification Data¹²

Indicator ¹³	KENYA						UGANDA					
	National		Urban		Rural		National		Urban		Rural	
	Pre-reform	Post-reform	Pre-reform	Post-reform	Pre-reform	Post-reform	Pre-reform	Post-reform	Pre-reform	Post-reform	Pre-reform	Post-reform
Electrification levels (%)	4.4	5.5	16.7	20.4	0.5	0.8	2.9	4.1	16.7	18.9	0.7	1.1
Electrification rates (%)	7.0	6.2	6.2	6.0	16.1	7.7	13.7	10.5	17.9	12.0	-3.3	5.4
Tariff/Cost of Electricity (USc/kWh)	4.1	7.8	4.1	7.8	4.3	7.6	9.6	7.4	-	-	-	-
Per Household Consumption (kWh)	2,991	1,714	3,119	1,821	1,702	902	3,185	2,325	3,475	2,700	2,015	965
Per Capita Consumption (kWh/capita)	598	428	520	304	340	225	637	471	695	468	403	202

Sources: Kinuthia, 2003; Okumu, 2003; Nyoike, 2002; Kyokutamba, 2002; Engurait 2002

In their search to improve electricity performance and attract foreign investment, reforms have so far failed to advance public benefits such as rural electrification. However, Kenya has a draft energy policy under review and Uganda recently introduced a Rural Electrification Strategy and Plan for the 2001–2010 period. Kenya's draft policy proposes the establishment of a rural electrification agency; incorporates off-grid solutions; introduces fiscal exemptions for connections; and, provides for a lifeline tariff. Uganda is in the process of creating an Electrification Board to promote rural electrification and expand the use of mini-grid and PV systems (Karekezi, *et al*, 2003).

¹¹ Due to lack of data by income group, the rural population has been used as a proxy for the poor. This is justified by the fact that, for example, in Kenya, virtually the entire (100%) rural population falls under the US\$ 2 per capita per day compared to about 80% in urban areas. When the US\$ 1 measure is used, the proportion of the rural poor remains significantly high at 80% compared to only 40% for urban areas.

¹² For Kenya, the pre-reform year considered is 1993 while the post-reform year is 2001. In the Ugandan case, the pre-reform year considered is 1996 while the post-reform year is 2002.

¹³ Data indicators are based on domestic connections only and may, therefore, differ from data provided in other sources.

Both the proposed electrification agencies in Uganda and Kenya make no special provisions for targeting the poor nor are the respective boards required to include representatives of the poor. Consequently, the interests of the poor may not be adequately protected under the proposed institutional arrangements.

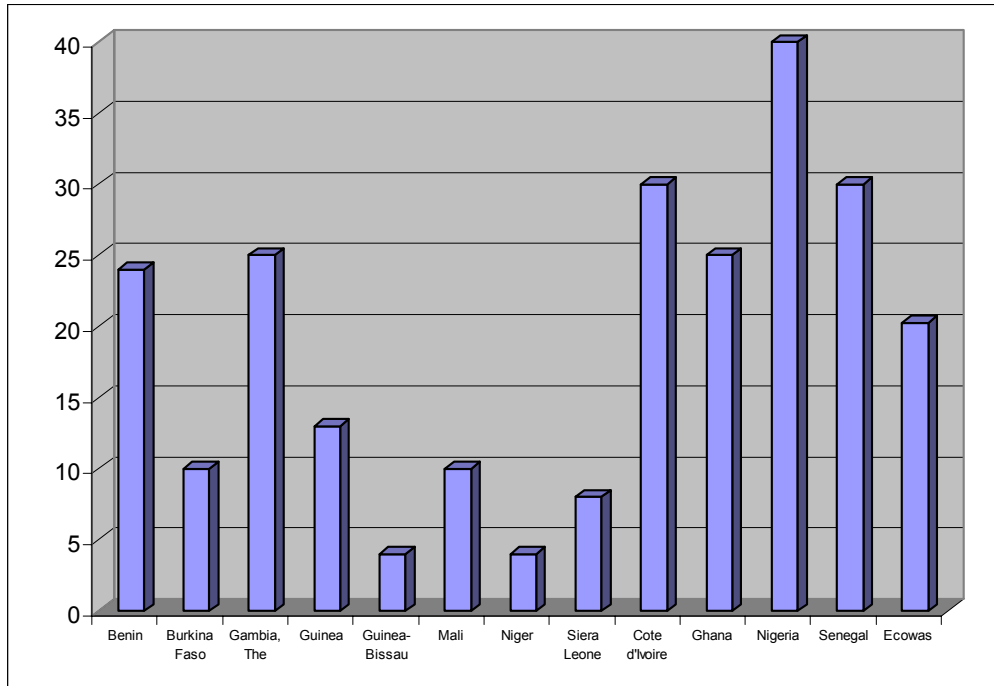
Key findings and recommendations

- At present, data on the electrification of the poor in Uganda and Kenya is scarce, hence the use of proxies that are not fully satisfactory. Databases should be developed to keep track of electrification of the poor.
- As demonstrated by the high levels of electrification in Mauritius – a late reformer, there is a case for arguing that countries, whose market-oriented reforms are not at an advanced stage, should make provision for increased rural electrification before embarking on large scale pro-market reforms such as privatisation.
- One option for protecting the interests of the poor would be to introduce safeguards that prevent “cherry picking” of high income urban-based customers by private investors. For example, explicit pro-poor electrification targets could be made a prerequisite for the purchase of attractive distribution rights.
- The newly created rural electrification agencies should be autonomous and must have ambitious targets for electrification of the poor. In addition, the governing boards of these agencies should include representatives of the poor to ensure that their concerns are addressed.
- The funds for the electrification of the poor should be “ring-fenced”, in other words, protected to ensure that the funds are utilised solely for electrification of the poor.
- Finally, reforms should ensure that tariffs are affordable by the poor. In particular, fixed charges and connection fees should be minimised.

1.3.2 West Africa: Senegal and Mali Case Studies

Electrification in Western Africa remains very low. The per capita consumption varies from almost 350 kWh in Ghana to 27 kWh in Burkina Faso. Access to electricity in the ECOWAS region¹⁴ at large is limited to 20%. In Côte d'Ivoire, Nigeria, and Senegal, it ranges from 30% to 40%, and it is as low as 4% in Niger and Guinea Bissau (Sarr, *et al*, 2003; Edjekumhene, 2003). In addition to the disparities between countries, a large disparity exists within individual countries between urban, peri-urban and rural populations in terms of access to electricity.

Figure 3 Population with Access to Electricity (%)



Source: Sarr, *et al*, 2003; Edjekumhene, 2003

The reforms of the electricity sector were implemented at different time intervals in different countries of West Africa: Côte d'Ivoire was the first to implement reforms in the early 1990s, followed by Senegal, Mali, The Gambia, and, finally in 2003, Benin. In all of these cases, the key objectives of the reforms were to enhance technical efficiency (renovation and extension of the grid, improvement of the quality of electricity), financial and managerial performance of the main utility – none of them made explicit mention of improving the poor's access to electricity. This is in spite of the fact that many of the countries have listed poverty reduction as one of their national priorities by adopting Poverty Reduction Strategy Papers.

The Governments of Senegal and Mali reviewed their energy policies and strategies and embarked on electricity sector reform, starting in 1997 for Senegal and in 1999 for Mali. Senegal has set an electrification target of 50 per cent (60 per cent for urban areas and 15 per cent for rural areas) by 2005 (Sarr, *et al*, 2003).

The key elements of reform in the two countries included:

- Private sector participation in the two existing state-owned utilities, expected to generate attractive returns for its new private sector shareholders.

¹⁴ ECOWAS refers to the Economic Cooperation of West African States

- Regulation of the new companies by an independent regulator.
- Authorisation of private investment and participation in system expansion (e.g. by development of IPPs).
- Existing and future assets to remain under government ownership, but leased to the private sector with associated investment obligations.

In Senegal, urban electrification rates showed a slight increase in the post reform period (1999 - 2001), registering electrification rates of about 7 per cent compared to an average of about 5 per cent in the 1990–1998 period. However, the trend in the rural electrification rates (considered as poor for the purposes of this study) showed an opposite downward trend — a clear indication that the reforms in Senegal have not helped poor people in gaining access to electricity (Sarr, *et al*, 2003).

Table 4 Electrification Rates (%) in Senegal¹⁵

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Rural	12.2	12.2	12.2	26.0	1.9	8.2	11.8	10.0	18.7	16.6	1.4
Urban	5.7	6.0	6.0	5.7	7.6	0.1	4.8	3.2	5.9	6.0	8.3
Overall	6.1	6.4	6.4	7.6	7.1	0.9	5.5	3.9	7.4	7.4	7.4

Sources: The authors on the basis of SENELEC data

Source: Sarr, *et al*, 2003

In Mali, the national electrification level rose substantially in the post-reform period. However, this can mainly be attributed to a sharp increase in the connections in urban areas, while rural levels (where the bulk of the poor reside) stagnated. The low number of connections in rural areas is partially attributed to the high cost of the connection fees relative to the income levels of the poor. It is estimated that connection fees are equivalent to about 97% of the maximum annual income of the poor (Sarr, *et al*, 2003).

Key findings and recommendations

Data on the electrification of the poor in both Senegal and Mali appear to be inadequate, hence the use of proxies. In the case of Mali, generic data on the power sector was also limited. In addition, the two countries undertook major market-oriented reforms only recently. It might, therefore, be too soon to provide a comprehensive assessment of the impact of market-oriented reforms on the poor. However, based on the available data and information, it is possible to provide some tentative insights.

First and foremost, this study indicates that the Governments of Mali and Senegal appear not to have comprehensive and explicit policies for increasing the electricity access of the poor within a reforming power industry. This study highlights the fact that market-oriented reforms appear to have done little in making the cost of electricity connections and consumption more affordable to the poor. All the signs seem to indicate that the poor have not been specifically targeted, and are expected

¹⁵ The data provided in this table is derived from SENELEC - the Senegalese national electricity utility - and is, therefore, the best available data set.

to “goorgorlou¹⁶” in order to pay the relatively high connection costs and monthly bills as their better-off compatriots. In both of the cases, the connection fees are very high compared to the poor’s income.

Essentially, the policies and measures that have had a positive impact on poor people’s access to electricity have been those that have seen control of the electricity sector, remain with the government. The privatised SENELEC and EDM will have no policy for, and apparently no particular interest in, increasing the access of the poor to electricity – it is much more concerned with ensuring its activities are profitable. The main objective of the privatisation of SENELEC as well as EDM was to enhance the efficiency of the electricity system and to safeguard the stability of power supply in a competitive market.

Secondly, preliminary assessment of some of the indicators reveals that the poor could have been negatively impacted by the reforms that were primarily market oriented. For example, the assessment of electrification rates in Senegal indicates that during the period prior to market-oriented reforms, electrification rates of the poor were higher than those of the non-poor. This trend appears to have been reversed following the reforms.

With respect to electricity tariffs, in Senegal, it appears that the poor, on a relative basis, pay significantly more than the non-poor. On average, expenditure on electricity by the poor is estimated to account for 25% of their annual income. In Mali, a comparison between the pre- and post-reform period reveals that tariffs for the poor have increased.

On the other hand, more recent reforms that specifically target the needs of the poor may have some positive impacts on the electrification of the poor. In both countries, rural electrification agencies have been established and given the mandate for reaching the poor. However, the benefit of increased electrification may not be realised in the foreseeable future given that the rural electrification agencies in both countries are not yet fully operational and their ability to finance ambitious rural electrification programmes is not fully assured.

The experience of Mali and Senegal once again demonstrates the importance of sequencing. Measures designed to extend electricity to the poor are being enacted at the tail end of the reform process - resulting in near-term stagnation in electrification rates of the poor.

¹⁶ A West African term for scrounging and begging.

1.3.3 Southern Africa: South Africa and Zimbabwe Case Studies

The average level of access to electricity in Southern Africa is about 23 per cent, although for countries such as Angola, D.R. Congo, Lesotho, Malawi and Mozambique the figure drops to less than 9 per cent. It is over 40% for Zimbabwe and almost 70% for South Africa (Davidson & Sokona, 2002; World Bank, 2001).

Both South Africa and Zimbabwe have embarked on power sector reforms against a historical background in which a large majority of their citizens were deprived of electricity and other services on racial grounds. Addressing this deficiency has called for rapid and ambitious electrification programmes.

The countries adopted different approaches in their programmes. South Africa depended on internal financing, mostly from the government and from its financially sound national utility Eskom, while Zimbabwe's effort was partially dependent on donor funding. Both countries have used a mixture of grid and off-grid systems. The electrification initiatives in both countries have shown improvements in overall levels of access, though at different rates.

In 1994, South Africa launched the first phase of a national electrification programme which aimed to increase the national electrification level from 36 per cent to around 66 per cent. By the end of 2001, more than 66 per cent of households had been electrified, with nearly 3 million connections made since 1994 (NER, 1999; Borchers, *et al*, 2001). The focus was on previously disadvantaged, rural areas, schools and clinics.

An off-grid scheme (using photovoltaic systems) was launched in 1999, aiming to provide 350,000 solar home systems (DME, 2001; Karottki & Banks, 2000). A follow-up programme provided photovoltaic (PV) systems to schools and clinics.

Large-scale electrification programmes in Zimbabwe began when the country gained independence in 1980. Unlike South Africa, Zimbabwe was partially financed by external sources and later used internal measures to raise the required investment funds. Institution of the latest round of more market oriented reforms began in 1999, with the Government of Zimbabwe considering unbundling of the electricity sector; setting up of a regulator; introducing a privatisation programme; and establishing a rural electrification fund. This fund is reported to have contributed to the extension of grid electricity to rural (poor) households although implementation appears to be slow.

With the Zimbabwe Electricity Supply Authority (ZESA) forming the nucleus of the generating, transmission and distribution systems, electrification levels in Zimbabwe grew from 20 per cent in 1990 to 42 per cent in 2001 (World Bank, 2003; Kayo, 2002). In addition, around 85,000 solar home systems (SHSs) were installed under a Global Environment Facility (GEF) project making Zimbabwe one of the countries with the largest number of SHSs in Africa (Mapako and Afrane-Okese, 2002; World Bank, undated).

The Governments of South Africa and Zimbabwe have taken steps to specifically address the electrification of the poor. South Africa stipulated specific electrification targets for the power industry, while Zimbabwe established the rural electrification fund.

In 2002, South Africa introduced a direct subsidy for the poor in the form of a "poverty tariff". Under this scheme, 20–50 kWh per month of electricity are to be provided free

to the poorest section of the population (Davidson & Mwakasonda, 2003; Wentzel and de Lange, undated). A recent evaluation of the pilot areas that have implemented the poverty tariff recorded, amongst other benefits, an increase in average monthly household incomes; around 30 per cent of households in some communities adding lights to previously non-electrified rooms; and, children being able to study for longer periods thanks to better lighting. Communities benefiting from the poverty tariff also report 33 per cent of households starting to use appliances they were previously not able to use (Davidson & Mwakasonda, 2003).

Lifeline tariff subsidies in Zimbabwe entail preferential pricing for domestic consumers with lower consumption levels (Table 5). A flat rate of Z\$3.21 is charged to units above the 1,000 kWh block, but this charge is less than the actual charge of Z\$4.13 per kWh that is required to meet the cost of service and returns for system expansion. Subsidies are also extended to the connection fees, whereby ZESA charges below the true connection cost.

Table 5 Electricity Tariffs for the Domestic Sector

<i>Consumption block</i>	<i>Tariffs/kWh (Z\$)</i>	<i>Tariffs/kWh (US \$)¹⁷</i>
<i>Year 2001</i>		
Up to 50 kWh	0.99	0.018
Up to 300kWh	1.10	0.020
Up to 1000kWh	3.09	0.056
Above 1000kWh	3.21	0.058
<i>October 2002</i>		
Up to 50 kWh	2.78	0.050
Up to 300kWh	3.06	0.055
Up to 1000kWh	7.18	0.130
Above 1000kWh	7.45	0.135
<i>November 2003</i>		
Up to 50 kWh	5.48	0.007
Up to 300kWh	6.01	0.007
Up to 1000kWh	14.09	0.017
Above 1000kWh	14.60	0.018

Source: Davidson and Mwakasonda, 2003; Dube, 2003

The off-grid schemes implemented in the two countries have had mixed results. In South Africa, rural beneficiaries of off-grid systems (mainly SHSs) have reported that they are paying between 73 and 93 per cent more than grid users for supply and only have lighting and media access, whereas grid users are able to use stoves, lights and appliances simultaneously and for longer periods.

Maintenance also seems to be a problem. In South Africa, of 1,400 SHSs installed between 1996 and 1998, only 6 per cent were operational in 2000 (Davidson and Mwakasonda, 2000; Klunne, 2002). In Zimbabwe, about 30 per cent of the SHSs

¹⁷ Official exchange rate (around US\$1=Z\$55) used in the conversion of tariffs in year 2001 & 2002. Parallel market exchange rate, however, applied in the conversion of year 2003 tariffs.

installed under the GEF project failed within two years of installation (Mapako and Afrane-Okese, 2002).

Key findings

Based on the available data and information used in the assessment of the electrification programmes in South Africa and Zimbabwe, the following are the key findings of the study:

In both countries, the quality of data on the electrification of the poor is not fully satisfactory. Although, for instance, the National Electricity Regulator in South Africa keeps track of rural electrification, the data is not, however, categorised into poor and non-poor. Consequently, the findings and conclusions of this study are not fully conclusive.

Both countries have a history of past racial injustices and the need to redress the past inequalities forms the basis of their reform programmes but were financed differently. The democratic governments that emerged after liberation embarked on reform programmes specifically addressing wider access to electricity services and poverty alleviation among the formerly underprivileged population – which also happens to constitute the majority of the poor. Market oriented reforms such as privatisation are being considered only after substantial progress in the electrification of the poor has been realized.

The reforms undertaken to widen access to electricity have registered encouraging progress in both countries. The positive impact on the poor of the South African electrification programme has been particularly encouraging. For example, the preliminary assessment of the “poverty tariff” in South Africa, which supplies 20-50kWh of free electricity to the poor in selected areas, indicates positive impacts on the poor. Nonetheless, this is a very recent development and additional studies may be required to assess the long-term viability and sustainability of the programme which at present is costing the South African Government about R630 million (close to US\$ 100 million) annually (Davidson and Mwakasonda, 2003; Wentzel and de Lange, undated).

The reforms in both Zimbabwe and South Africa ensured the protection of the funds for financing the electrification of the poor by ensuring transparency and accountability, albeit in different ways. In the South African case, the National Electricity Regulator (NER) aggressively monitors and makes public the progress of the National Electrification Programme through the NER’s annual reports. In Zimbabwe, the Performance Improvement Programme included explicit rural and urban electrification targets that the utility was obliged to meet. The progress of the Rural Electrification Programme is also reported in ZESA’s annual reports.

An interesting observation is that, in both countries, in spite of having gained independence during a time when privatization and pro-market reform of the power sector was sweeping across the continent, they both did not commence pro-market reforms until after undertaking substantial electrification. This appears to reflect the experience of Mauritius and supports the thesis that it is best to embark on electrification of the poor before (or at least, at the same time as) the initiation of pro-market reforms such as privatisation.

1.3.4 South and South East Asia: India and Philippines Case Studies

India and the Philippines have, in the recent years, reformed their energy sectors. The reform process in India provided limited provision for enhanced access to electricity by the poor¹⁸, whereas legislation in the Philippines clearly defined marginalised consumers, provided lifeline tariffs for the poor and covered cross-subsidies, subsidies and network expansion.

Reforms initiated by India's central government, in 1991, focussed mainly on increasing the flow of capital towards additional power generation investment followed by reform of the distribution sector. So far, two states have unbundled and privatised distribution, seven have introduced vertical unbundling and restructuring and independent regulatory commissions have been set up in twenty-one states.

The experiences of three states, Karnataka, Himachal Pradesh and Orissa throw some light on India's experience with reform:

Karnataka vertically unbundled its generation, transmission and distribution sectors; set up a regulatory commission; and corporatised its electricity board. As part of the reform, it was stipulated that tariffs should reflect the cost of supply and the existing cross-subsidy should be reduced.

In Himachal Pradesh, reforms included the setting up of a regulatory commission and in Orissa—the first state to reform—it included vertical unbundling into separate generation, transmission and distribution companies.

In Orissa, privatization of the electricity sector led to the main electricity utility transferring the management of service delivery to about 5,000 villages (with a DFID funded support) to a local NGO. It is reported that losses have declined, services improved and revenue increased. There are plans to establish franchise areas with local businesses (Davies, per. Comm., 2003; XIM, 2003).

In India and Philippines, utilities do not maintain consumer data according to income groups. The study, therefore, used supplementary proxies to distinguish the poor and the non-poor.

Available data indicates that, during the post-reform period, the aforementioned three Indian states have experienced reductions in their electrification levels and rates and have either seen tariff increases intended to bring prices in line with costs, and/or reductions in cross-subsidies that have adversely affected the poor (Sihag, *et al*, 2003).

On the other hand, in the Philippines, the Act makes special provisions for the poor through the provision of an electrification fund that ensured increased electricity access among the poor and by protecting the subsidies provided in life-line tariffs for the poor for a decade.

The Philippines Government began considering reforms in the late 1990s, to pave the way for privatisation of its National Power Corporation (NPC). In June 2001, the

¹⁸ The limited attention given to the electrification of the poor in India could be a backlash to past electrification programmes that were poorly implemented, poorly targeted - the non-poor captured a significant portion of the benefits - and contributed to the very poor performance of state power utilities.

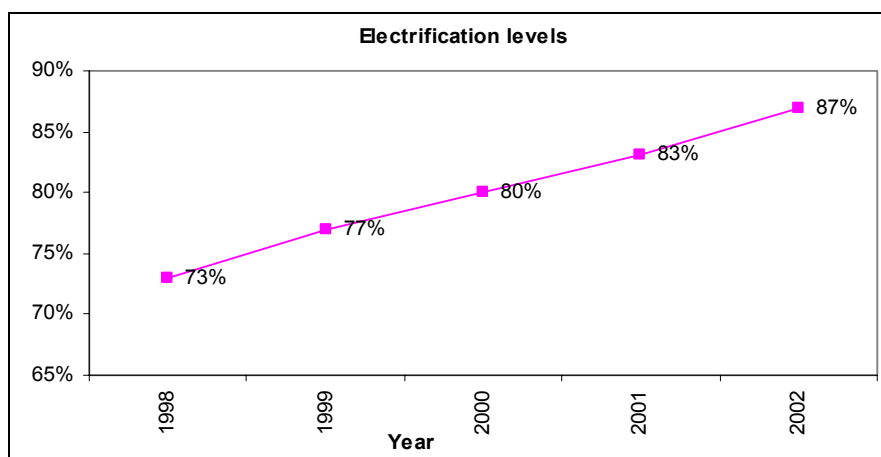
Electric Industry Reform Act was passed. This mandated restructuring of the electricity industry and privatisation of the state-owned National Power Corporation (NPC) as well as laying the foundations for privatisation of the existing Rural Electrification Corporation (REC), which had been designated as the country's primary electricity distribution system in the 1960s. The Act also set up a new independent regulatory commission to oversee rural electrification; lifeline rates for marginalised consumers; and, a levy for rural electrification.

The Act also stipulates that price structures are to reflect the true costs of serving the different categories of customers, a process which will require some shift in existing subsidies. However, this is to be done gradually over three years— but extended to ten years for low-income users—and provision is made for lifeline tariffs. Lifeline tariffs and extension of electricity services to remote areas will be subsidised by a universal charge on other consumers.

More recently, the Philippines Government has set electrification of all villages as a target for 2006. Renewable energy technologies will be used—under the “O’Ilaw Programme”—for electrification of the most isolated “barangays” (villages). Inhabitants of the barangays are considered to be poor. This programme is implemented by government agencies, but a complementary programme will seek to maximise private sector involvement.

As illustrated by the graph below (used here as a proxy for impact of reforms on the poor), the electrification of barangays – a programme that commenced prior to the introduction of privatisation, continued to witness substantial growth during the reform period.

Figure 4 Overall Electrification Levels in Barangays



Source: Sihag, *et al*, 2003; REP, 2003

Levels rose on average by around 2 per cent per year between the 1970s and 1998, then by around 3.5 per cent per year between 1998 and 2002—a clear illustration of the positive impact of the Philippines' Government programme. Barangays are being electrified at a rate of about 1,900 per year, double the average accomplished prior to the “O’Ilaw Programme” (Sihag, *et al*, 2003; REP, 2003).

Key findings

- With the exception of reforms in Orissa state, electricity reform in India has, unfortunately, largely neglected the poor. The Indian Reform Act does not consider rural electrification and upgrading of the system. This is a major oversight that needs to be addressed by policy and legislation changes.
- Conversely, legislation in the Philippines has clearly defined marginalised customers, makes provision for lifeline tariffs for the poor and considers subsidies to help meet the electricity requirements of the poor. This has led to rapid increases in electrification of the poor further underlying the need for specific measures in the reform process aimed at protecting the needs of the poor.

1.3.5 South and South East Asia: Thailand, Bangladesh and Vietnam Case Studies

Electrification levels in South and South East Asia range from 30 and 50 per cent for rural areas, and from 68 and 90 per cent in urban areas. However, levels in the different countries in the sub-region vary widely, from a high of 100 per cent in Singapore to a low of 5 per cent in Myanmar (Shrestha, et al, 2003; World Bank, 2003) The table below illustrates this wide disparity.

Table 6 Access to Electricity and Per Capita Consumption in South and South East Asia (2000*)

Region	Country	Electrification level (% of population)	Per capita electricity consumption (kWh/capita)
South Asia	Bangladesh	31.0	96 (2002)
	India	43.0	379
	Nepal	15.4	47
	Pakistan	52.9	321
	Sri Lanka	62.0 (2001)	255
Southeast Asia	Cambodia	15.8 (1998)	78(1999)
	Indonesia	53.4 (2001)	345
	Laos	33.0 (2002)	113(1999)
	Myanmar	5.0	71
	Malaysia	90.0	2,474
	Philippines	54.0 (2002)	454
	Singapore	100.0	6,641
	Thailand	98.5(2002)	1,448 (2002)
Vietnam**	77.4 (2001)	285 (2001)	

Source: Shrestha, et al, 2003; IEA, 2002; NSO, 2000; Temple, 2002; World Bank, 2003; ECA & MDE, 2002

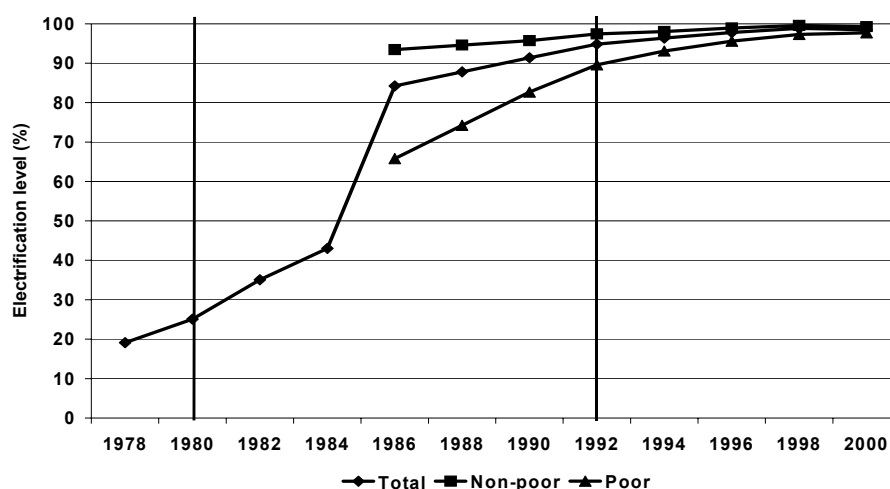
* - Unless otherwise specified

Thailand, Bangladesh and Vietnam have taken steps designed specifically to increase electricity access for the poor although in varying degrees: a single, large, publicly-owned utility in Thailand; cooperative approach in Bangladesh; and mixed approaches in Vietnam¹⁹.

In the early 1970s, only 7 per cent of poor households in Thailand had access to electricity. As shown in the following figure, by 2000 this had increased to 98 per cent (Shrestha, et al, 2003; PRESSEA, 2000a).

¹⁹ In the absence of disaggregated data by income level, rural households are used as a proxy for the poor while urban households are considered to be a proxy for the non-poor in the cases of Bangladesh and Vietnam. In the case of Thailand, households in non-municipal areas or those with monthly electricity consumption of 150 kWh or less are used as the proxy for the poor.

Figure 5 Electrification Levels in Thailand



Sources: NSO, 1971-73, 1975-76, 1981, 1986, 1988, 1990, 1992, 1994, 1996, 1998, 1999, 2000, 2001; PEA, 1982, 1987, 1989, 1991, 1992, 1994, 2001, 2002; Chulalongkorn University, 2003

Thailand's achievements were the result of an Accelerated Rural Electrification (ARE) programme based on a master plan for rural electrification drawn up by the country's Provincial Electricity Authority (PEA). Initiated in 1974, the master plan placed emphasis on expansion of rural electrification via the grid, and on institutional restructuring. The programme was implemented by an Office of Rural Electrification, set up specifically for that purpose.

In 1992, an Act reforming the country's Electricity Generating Authority (EGAT) was passed. Known as the EGAT Act, this allowed independent power producers and small power producers to generate power in the country and allowed EGAT to engage in energy-related business activities. This major structural reform was followed, in 1990–2000, by a series of tariff adjustments that resulted in a steady increase of tariffs. However, neither the EGAT Act nor the tariff reforms seem to have adversely influenced the already very high electrification level. However, the growth rate of electricity consumption by poor users seems to have slowed somewhat in recent years.

Bangladesh's reform effort began in 1977. In 1976, only 3 per cent of its total population had access to electricity (REB, 2002), with supply being controlled by a single vertically-integrated, public utility that concentrated its activities in urban areas. This left the rural areas, which constitute 90 per cent of the country's territory, virtually without supply. In 1977, the government created a Rural Electrification Board to expand electrification through the institution of *Palli Biddut Samity* (cooperatives). In a typical *Palli Biddut Samity*, customers are members of a cooperative which draws up the electrification master plan for the area it covers. The first *Palli Biddut Samity* was established in 1980.

In 1982, only around 26,000 poor households (0.2%) had access to electricity, by 2000 that figure had risen to over 4 million, bringing the proportion of poor households with access to electricity to 19 per cent (Shrestha, *et al*, 2003; Dhakal, 2003). This represents considerable progress, even though the percentage with access remains rather low. One of the reasons for this may be the relatively high

upfront cost of joining a Palli Biddut Samity—around US\$15–23, which was beyond the reach of many poor people.

In Vietnam, Electricity of Vietnam (a management holding company) and a special office for rural electrification were set up in 1995. Electrification levels for the poor increased from 50 per cent prior to this reform (i.e. in 1993) to 77 per cent in 2001 (Shrestha, *et al*, 2003; PRESSEA, 2000b).

Vietnam experienced regular tariff increases in the 1990s. In 1997, the Government, in order to meet the conditions for a loan from the Asian Development Bank for an electrification project, agreed to increase tariffs to bring them more in line with long run marginal cost. However, as shown in the table below, tariff increases for the poor have been restrained while tariffs for the non-poor have risen more sharply, especially in recent years.

Table 7 Average Electricity Tariffs in Vietnam (1992 USD/kWh)

	Pre-reform		Post-reform			
	1992	1994	1996	1998	2000	2002
Non-Poor	0.019	0.038	0.041	0.044	0.045	0.052
Poor	0.016	0.032	0.032	0.032	0.032	0.035

Source: EVN, 2003; ASEAN, 2000

Key findings and recommendations

- Thailand and Vietnam's approaches, addressing rural electrification directly through a mixture of institutional and structural reforms, have produced positive results for access by the poor to electricity services. Case studies of Bangladesh, Thailand and Vietnam once again underline the need for specific measures in the reform process designed to protect the interests of the poor.
- As demonstrated by the experience of Thailand (and to a lesser extent Bangladesh and Vietnam), the sequence of reforms is important. Electrification of the poor should precede (or at least be initiated at the same time as) market-oriented reforms.
- There is some evidence that recent tariff reforms in Thailand focusing on greater economic efficiency have resulted in higher average prices of electricity for both the poor and non-poor.
- Lack of availability of data on electricity access and expenditure by income category was a constraint for the study. More rigorous analysis would be possible if such data were available. It is, therefore, recommended that efforts be made to establish such a database.

1.3.6 China Case Study

China has an estimated 28 million people living in absolute poverty when measured against the national poverty line²⁰, and most of the poor live in the country's western rural areas. Most of the estimated 30 million people who do not have access to electricity in China also live in the western areas (ERI, 2003; Maria, 2004).

In the 1980s, the country undertook a programme for expansion of electrification with the core idea of introducing tariff incentives to encourage building of new power plants. In a second reform phase—lasting until 1998—corporatization of China's electricity industry was effected. A milestone in this reform phase was the creation of the State Power Corporation (SPC).

After 1998, the electricity monopoly was brought to an end and eleven electricity corporations were created from the SPC. A core concept of these market-oriented reforms was to introduce competition into the electricity market.

By 1998, the electrification level for townships, villages and houses was around 98 per cent for each of these categories. Household consumption increased from 21.5 kWh in 1986 to around 130 kWh in 2000 (ERI, 2003; SHP, 2002).

Until 1998, rural electricity tariffs tended to be much higher than those for urban areas. Since then, providing the same pricing system for both rural and urban areas has formed part of the reform process. By 2002, twenty-three of China's thirty-one mainland provinces were applying the same pricing system. The benefit of these tariff reforms for rural consumers is evidenced by increases in consumption levels of 15–20 per cent in several provinces (ERI, 2003).

According to government statistics, the majority of people without electricity in the western provinces live in remote areas far away from power lines. It, therefore, seems unlikely that utility companies—increasingly conscious of their balance sheets—will be able to supply them from the grid in the near future. Some communities use diesel-powered mini-grids, but most rely on traditional biomass, giving rise to major health and environmental concerns.

To alleviate this situation, China's Government is supporting the use of renewable energies under policies with the following targets:

- Economic development of rural areas, especially those in the western provinces.
- Reducing the gap between areas with grid supply and those without.
- Improving living standards in rural areas.
- Sustainable supply of electricity to regions without grid.
- Protection of the natural environment.
- Creation of new industry, markets and jobs.

In 2001, the Government authorised more than US\$218 billion for the National Township Electrification Programme to provide electricity to more than 1,000 townships (ERI, 2003). This will make use of hybrid (PV/battery) systems as well as small hydro, solar and wind technologies, distributed as shown in the following table:

²⁰ Using the US\$ 1 per day, the poor comprise of about 58.2% of the population (ERI, 2003; Maria, 2004)

Table 8 Distribution of Power Sources in the National Township Electrification Programme²¹

Type	Number of Systems	MW
Small Hydro	378	200
Solar Power	666	20
Solar/Wind Hybrid	17	0.8*

*Power from wind turbines

Source: ERI, 2003

China has identified a number of factors requiring attention if the long-term viability of these renewable energy projects is to be guaranteed.

Current forms of management, often based on village cooperatives, may suffer from lack of training of system operators, lack of technical backup, insufficient financing and revenue streams, and lack of incentives for management performance.

Information on renewable energy sources is a precondition for successful design. Populations without electricity in China, as in many parts of the world, are scattered in very remote regions where information on such systems is nonexistent. In the past, installation of village systems with inadequate information has led to poor performance.

System problems can also arise from imposition of a set system configuration without consideration of local resources or the unique requirements of a village, or from inadequate knowledge on the part of users. This is especially important in China where problems of access to remote provinces create major difficulties for after sales service.

Village renewable energy systems in China receive government subsidies, sometimes making the electricity tariffs unrealistically low. Tariffs should attempt to reflect actual cost and quality of service and the revenue base should at least cover operators' salaries and the costs of equipment maintenance and batteries. If these costs are not covered in the long term, failure of the system is almost inevitable.

Key findings and future prospects

- China's most rapid increase occurred before the advent of market-oriented reforms resulting in electrification levels of 98% by the year 1998. This seems to support the need to carefully sequence reforms. From China's experience, one could infer that electrification of the poor should precede (or at the minimum, be launched at the same time as) the initiation of major market-oriented reforms.
- China's efforts in extending grid connections and tariff reforms (that reduced rural electricity tariffs) in the country's poorest areas have increased electrification level and electricity consumption in those areas thus confirming the need for explicit pro-poor measures in the reform process.

²¹ Due to limited data availability, the one provided by ERI in this table is taken as the best possible data set.

- The recent national rural electrification programme will provide regional development experience of sustainable renewable energy systems that will benefit both China and the international community.

1.3.7 Latin America and Caribbean: Argentina, Peru & El Salvador Case Studies

In 2000, it was estimated that almost 48 per cent of the population of the Latin America and Caribbean (LA&C) sub-region was living below the poverty line. Around 20 per cent of the poor could be considered destitute (CEPAL, 2001-2002). Many of the poor find it difficult to access energy sources and, when they do, have difficulty in maintaining continuous and regular supply (FB, 2003 a). This is particularly true of the electricity sector and there are indications that it is due, to some extent, to a combination of the impact of reforms in the electricity industry and the impact of macro-economic reforms on the poor (Kozulj, R., *et al.*, 2003).

The proportion and numbers of poor people in urban areas of LA&C in relation to the total showed a significant increase in the 1990s with respect to the 1980s, and continued to grow throughout the 1990s. In 1980, the urban poor accounted for 46 per cent of all poor people in the sub-region (O'Donnell, 1996). By 1999, the proportion had risen to 63.5 per cent (CEPAL, 2001-2002; ECLAC, 2003).

In the past, illegal connections in urban areas tended to be ignored when the service was provided by state-run companies. Privatisation in the sector or demands that energy prices should cover the true costs of service have recently led to the issue being addressed openly and the situation of unauthorised users (mainly in urban areas) being "regularised". In many cases, this has been equivalent to removing a hidden subsidy, and some regularised customers are now experiencing difficulties in meeting bills (FB, 2003 a).

Radical reforms have been implemented in the energy sector of some LA&C countries. It must be borne in mind that structural changes in the energy sector often took place in a context of macro-economic reforms that affected the economic situation of consumers deeply and, in many cases, adversely. In certain cases (e.g. Argentina), restructuring of the energy sector was a centrepiece of those reforms, and must be viewed in that context (Kozulj, R., 2002).

In Argentina, reform involved unbundling of the three segments of the national electricity industry and privatisation of all assets belonging to the national companies. This process was implemented very rapidly between 1992 and 1993. In Peru, the process began in 1991. Its goal was also vertical unbundling of the electricity industry and privatisation of national company assets, although the process was slower than in Argentina. In El Salvador, privatisation of the electricity sector began in 1995-1996 with division of the Salvadoran national utility into two companies and the creation of a new one.

The pre- and post-reform situations in the three countries are summarised in the following table.

Table 9 Comparison of Selected Indicators from the Three Case Studies

Selected Indicators	Argentina		Peru		El Salvador	
	Pre-Reform	Post-Reform	Pre-Reform	Post-Reform	Pre-Reform	Post-Reform
Total electrification levels	91%	95%	38%	62 %*-72%**	62%	76%
National electrification rates	2.04% p.a.	1.03% p.a.	7.8 % p.a.	5.8 % p.a.	6.6 % p.a.	4.1 % p.a.
National average of per capita electricity consumption (KWh/month)	113	174	31	50	36	47
Average Household sector electricity consumption (KWh/month)	155	205	136	106	103.7	112
Poor households lifeline tariff proxy in US\$	4.35	11.77	6.8	17.2	4.8***	8.6**** 16.8*****

Sources: Secretaría de Energía; World Bank, 2003

Notes:

For the national average of per capita electricity consumption the years under consideration are as follows: Argentina: Pre-reform=1990; Post-reform=2000

Peru: Pre-reform=1993; Post-reform=2000

El Salvador: Pre-reform=1993; Post-reform=1999

* Data from SIEE, OLADE.

** Data from the household Survey.

*** Data for the 1979-1993 average of household average tariffs equivalent to the consumption band subsidized in 1998 & 1999. The variability coefficient (standard/average deviation) is 20.7 %.

**** Value corresponding to 1998 with its subsidy.

***** Value corresponding to 2001.

In Argentina, available data indicates that the proportion of expenditure for electricity in household budgets increased after reforms (Arza, C., 2002). While for many users this was due to increased consumption levels — made possible by macro-economic reforms that made imported household appliances relatively inexpensive — for poorer households, it was a consequence of tariff increases and reduced income in a context of increasing unemployment and wage reductions that also resulted from the macro-economic reforms. Connection fees lifeline tariffs and household tariffs also all rose sharply between 1989 and 2001.

In Peru, the overall electrification level increased from 38 per cent in 1990 to 62 per cent in 2000. This rapid increase may be explained by the high rate of urbanisation combined with a policy aimed at increasing access to basic public services. Total losses also increased sharply in the pre-reform period and then gradually decreased by 1999 (World Bank, 2003), possibly indicating that, as in other LA&C countries, migration to urban areas was accompanied by the post-reform regularisation of illegal connections.

As in Argentina, tariffs in Peru underwent substantial increases in the post-reform period, but a difference was that household consumption declined sharply, while this was not the case in Argentina.

After reforms in El Salvador, a sharp rise was observed in the lifeline tariff. This, combined with removal of subsidies, had negative impacts for households, presumably affecting the poorer households most. The overall access level stagnated in the post-reform period, but there are doubts if the indicator shows adequately the impact of the reforms or simply indicated the trend in the urbanisation levels.

Key findings and related issues

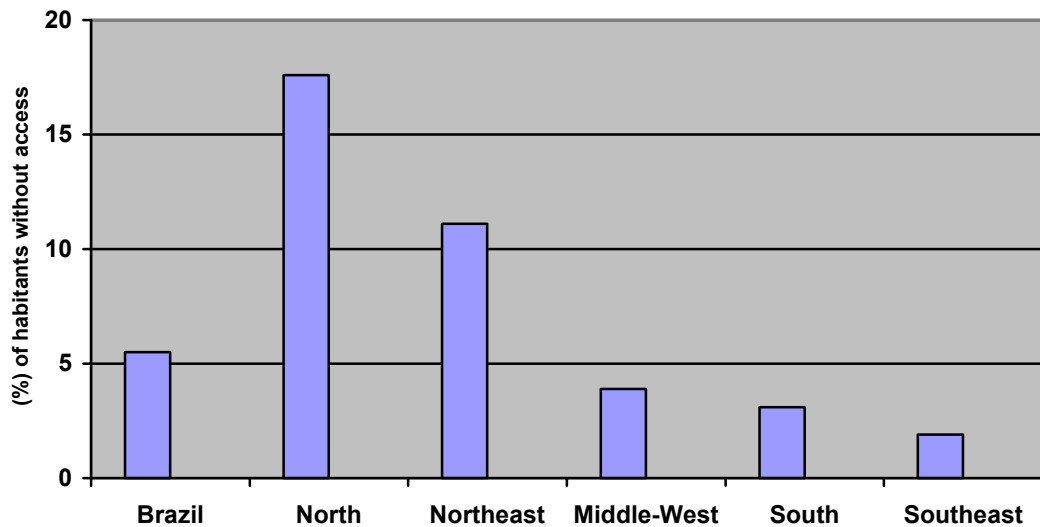
- In no way can macroeconomic policies be considered secondary to energy sector reforms, since this sector led the way in the privatisation process under the particular conditions created in order to guarantee an accelerated accumulation and ownership transfer. One of the main impacts of macro-economic reforms, especially in Argentina, was unemployment – creating a new group of the poor which had great difficulty in meeting electricity bills.
- Losses due to illegal connections have declined after regularisation of former “illegal” users. However, if macro-economic conditions make the regularised users increasingly unable to pay, this process may ultimately prove counter-productive.
- There is insufficient data to infer the impacts of reforms in terms of better access conditions of the poor to electricity services. However, the available data compiled indicates that at national levels, post-reform service expansion has shown a marked decline in the three countries²².
- The LA&C case studies demonstrate how the absence of explicit interventions aimed at the poor can result in reforms adversely affecting the interests of the poor.
- A decade after the introduction of reforms in these three countries, question of the role of the state, of subsidies and of the most desirable types of solution remain.

²² The slow-down might be partly due to the inevitable reduction that is expected once high levels of electrification have been realized. The unelectrified minority tend to reside in remote, difficult-to-reach rural isolated communities.

1.3.8 Brazil Case Study

There are major geographical differences in electrification levels in Brazil. States with the highest levels are those served by an interlinked grid extending from the north-east to the south-east of the country. The northern (Amazon) region is served by small local grids and off-grid systems mainly using diesel generators. Nationally, the percentage of the population with no access to electricity varies from about 18% per cent in the Northern region to about 2% in the Southeast region. The figure below shows these geographical differences clearly.

Figure 6 Regional Differences in Access to Electricity in Brazil



Source: MME, 2003; IBGE, 2003

Brazil initiated the restructuring of its electricity sector in 1993, by unbundling the generation, transmission and distribution components of the existing companies. This led to privatisation of most of the distribution component and of part of the generating component. A regulatory agency (ANEEL) was established for the sector in 1996.

The aim of restructuring was to maximise the value of assets and to minimise the concessionaires' obligations. Little attention was paid in this process to expansion of services to low-income and rural groups. Since then the Government of Brazil has taken some steps to correct this oversight.

Although overall levels of access to electricity by Brazilian households grew from 89 per cent in 1992 to 96 per cent in 2001 (IBGE, 2003; ESMAP, 2000), comparison of income with access to electric lighting shows a clear correlation—access is directly related to buying power, and rural areas have the lowest levels.

According to ANEEL, residential consumers experienced an average price rise for electricity of over 130 per cent, more than 30 points above inflation after the introduction of reforms in 1995 (IBGE, 2003). In recent years, this situation has been aggravated by a drop in average income of 5 per cent for the working population. These factors seem likely to have hindered expansion of electricity services, especially among the poor.

There is now a consensus in Brazil that supplying electricity services to the entire population is a basic public service. The Government has introduced initiatives to

promote rural electrification and is still developing the requisite framework of legal and regulatory instruments.

Together with donors, the Government supports two major programmes: *Luz no Campo*, a programme for grid extension aimed at electrification of a million new rural customers over three years; and *PRODEEM*, focussing on solar (PV) energy for remote communities.

Legislative efforts began in 1993, the year of restructuring, when a law was introduced to ensure financing of grid expansion and rural electrification programmes via a Reversion Global Reserve (RGR), financed by compulsory contributions from all concessionaires. The cost of the contributions was passed on in the tariffs introduced by concessionaires.

In 1995, a law was introduced requiring concessionaires and “permissionaires” (bodies having permission to distribute electricity) to provide comprehensive services to the market without excluding low-income and rural populations.

In 1996, an additional law made concessionaires responsible for the cost of providing services to new customers. Customers only have to meet tariffs for energy but not for connections. In the same year, the law that created ANEEL also required that half of the RGR resources be directed to the regions with lowest electrification levels and half be allocated to programmes for rural electrification, energy efficiency, and electrical power for low-income users.

In 1997, legislation stipulated that national energy policies must aim to identify the most suitable solutions to supply electricity to the different regions. It also established a National Council for Energy Policy (CNPE) one of whose responsibilities is to propose measures to supply energy to remote and hard to reach areas.

Lack of enforcement has detracted greatly from the effectiveness of these measures. In addition, the obligation to provide full coverage is not included in contracts between ANEEL and new concessionaires.

This latter omission is addressed in a law passed in 2002 which tightens universal service obligations on concessionaires. It also provides a definition of low-income consumers; extends ANEEL's role; allows permissionaires to use either grid or renewable solutions; establishes an energy development account to promote universal access and use of renewables; extends the RGR until 2010; and provides new customers a partial connection cost subsidy. Enforcement of this legislation is considered to be of key importance in overcoming barriers and achieving universal electrification.

Through Law 10,438 (2002), the poor are explicitly defined and classified into two categories: the low-income consumers with a monthly consumption of up to 80 kWh; and, “*customers under special conditions*” for those with monthly consumption of up to 220 kWh²³. This distinction helps in ensuring that the poor receive special benefits such as discounts on their electricity tariffs.

²³ This classification of the poor generally applies in all regions but some regions have slight variations. For example, ANEEL – the regulatory agency, classifies consumers of 140 kWh/month in the state of Pernambuco as low income consumers.

Key findings

- Although the energy reform process is not yet concluded in Brazil, it is clear that two of its alleged goals have not been achieved: competition has not reduced the tariffs (in fact, substantial increases have adversely affected poorer consumers); and the government has not been able to withdraw from investment in the energy sector.
- The Brazil case study provides convincing evidence that explicit and pro-poor measures are required to ensure that energy reforms protect the interests of the poor.

1.4 Some Common Findings of the “Energy Access” Study

Virtually all of the case studies stress that the poor quality of data sets dividing electricity consumers specifically into “poor” and “non-poor” categories is a hindrance to the gathering of reliable empirical data on electrification. For some studies, this is interpreted as a strong indication that the poor have generally been overlooked in the reform process. The East African report describes it as “*a crucial data gap*” that needs to be filled to allow fully reliable assessment of access to electricity, and to strengthen the basis for policy recommendations (Karekezi, *et al*, 2003).

The limitation in available data implies that the conclusions drawn from case study findings cannot be fully conclusive. Due to the aforementioned lack of reliable empirical data on electrification, some of the studies used proxies which can only provide general trends. A number of the case studies assessed only one reform option. This approach is constrained by the difficulty in distinguishing the effects of a single reform option from others put in place, especially where several options have been effected in a short span of time. As stressed by the Argentina case study, the impact of macro-economic reforms can cloud attempts to discern the impact of power sector reforms.

Based on the data and information available in the regional reports, the key common findings and conclusions of the “Energy Access” study suggest some important insights. These are summarised under the following sub-headings:

- Impact of power sector reforms on the poor
- “Ring-fencing” (protecting) funds for the electrification of the poor
- Sequencing of the reforms
- Explicit focus on the poor
- Participation of the poor in the electrification process

Impact of Reforms on the Poor

In spite of the aforementioned data unavailability, almost all the reports tentatively conclude that, based on available empirical evidence, market-oriented reforms have either had a neutral or adverse impact on the poor and should be redesigned especially if the reforms are to be justified under a poverty-reduction agenda. The key identified negative impacts on the poor include:

- Reduction in electrification rates;
- Increased tariff levels; and,
- Decline in electricity consumption.

These findings appear to concur with assessments recently undertaken by other analysts (see Wamukonya, 2003; Byrne & Mun, 2003; Fall & Wamukonya, 2003; Agbemabiese, Byrne & Bouille, 2003; Lash, 2002; Bouille, Dubrovsky & Maurer, 2002; Dubash & Rajan, 2002; Edjekumhene & Dubash, 2002).

In most cases, market-led reforms which are primarily designed to improve the financial health of electricity companies, have been introduced into countries where a large sector of the potential “market” consists of very poor people. Looking at this, for a moment, from the point of view of a reformed utility can help to clarify the situation. Expansion of access to electricity to the poor means attempting to service low-income consumers whose incomes may well be highly unstable and who often live in isolated areas that are difficult to access. To provide services, companies have to cover operating and investment costs (required by market oriented reforms) while

providing expensive transmission lines and connections, as well as maintenance, billing and collection services in a market where return on investment is far from being assured. In the majority of the countries covered by the case studies, these contradictory demands have proved to be irreconcilable. It is, therefore, not surprising that electricity companies have tended to “cherry pick” the most lucrative markets, have raised their tariffs and have been tempted to ignore widening of their networks to poorer consumers.

Where reforms require that prices cover the true cost of supplying electricity, and where governments have left market forces to determine tariffs, these have risen. Tariff increases as well as connection costs have been a major barrier to access to electricity, often putting it beyond the reach of poor populations, even in areas where the service is theoretically available.

Fixed charges for connection and for given amounts of electricity without metering have also proven to be a barrier. Connection charges are often far beyond the reaches of the poor, and obliging consumers who use only 20 kWh to pay the same amount as those using 100 kWh is obviously biased against the smaller, and usually poorer, user.

On the other hand, the country case studies also found out that not all forms of reforms have been detrimental to the electrification of the poor²⁴. Reforms in the Philippines, Thailand and Vietnam have produced some positive results for electrification of the poor. Although they have implemented a variety of reforms and have used different systems to manage delivery of services, they have in common a high level of government involvement and special focus on protecting the interests of the poor. By identifying marginalised users, maintaining subsidies or lifeline and other favourable tariffs where necessary, and instituting specialist bodies to oversee electrification, these countries have gone some way to protecting their poor from the adverse effects of market-led reforms and have widened their access to electricity.

For example, in Philippines, the legislation clearly defined the marginalised customers and made provisions for lifeline tariffs for the poor (Sihag, Chaurey and Pachauri, 2003). Similarly, in South Africa, free electricity to the poor in the range of 20 – 50 kWh per month was recently introduced and is said to yield positive results such as decreasing household energy expenditure and increasing electricity consumption among the poor (Davidson and Mwakasonda, 2003).

Another important positive outcome of reforms identified is the amendment of the Electricity Acts leading to the establishment of semi-autonomous Rural Electricity Agencies (Karekezi, *et al.*, 2003). With an appropriate institutional framework and sound management, rural electrification agencies could go a long way in ensuring the majority of poor access electricity services. Thailand provides a good example of how rural electrification agencies could facilitate electrification of the poor (Shrestha, *et al.*, 2003).

In some countries, subsidies on electrification infrastructure as well as cross-subsidies on electricity consumption have been introduced. Reforms, through the amended Electricity Acts, have provided for the establishment of national/rural electrification funds (eg. Philippines, Zimbabwe, South Africa, Uganda and Kenya) to

²⁴ In some countries, some of the reforms with anticipated positive impacts on the poor are yet to be implemented. For example, a number of the rural electrification agencies in Eastern and Western Africa stipulated in the amended Electricity Acts are not yet operational and financing of their electrification programmes is not fully assured.

subsidise the cost of grid extension to the rural areas. In Senegal, cross-subsidies have been introduced to minimise the cost of electricity among low-income domestic consumers (Sarr, *et al.*, 2003).

“Ring-fencing” (Protecting) the Funds for Electrification of the Poor

As mentioned earlier, reforms introduced Rural Electrification Funds and other mechanisms for financing capital investment for rural electrification. In many countries, however, the Acts are not explicit on how the agencies responsible for managing the funds would account for the additional financing resources. In other words, the funds for electrifying the poor have not been protected - “ring-fenced”²⁵. This has been cited as the case in Kenya and Uganda. Kenya’s Rural Electrification Fund has effectively been confiscated by the utility and used to cover operating costs – translating to almost complete halt to rural electrification (Karekezi, *et al*, 2003). It is, therefore, critical to ensure that the funds for the electrification of the poor are not misallocated.

Among the country case studies examined in the “Energy Access” study, Brazil and South Africa emerge as model examples of how to ring-fence the funds for electrification of the poor. In Brazil, there are two important measures that have been implemented: Firstly, the Electricity Act has made it mandatory for all electricity distribution concessionaires to contribute to the Reversion Global Reserve – the national electrification fund. Secondly, the allocation of the funds for electrification by the Reserve has been predetermined by region and matches the electrification needs of specific regions. Thus, the least electrified regions receive a greater share of the fund than the highly electrified ones. About 50% of the Reserve is allocated to the North, North East and Mid-West regions which are the least electrified regions (Goldemberg, *et al*, 2003; Rudzit and Pilchowski, 2002; C&T Brazil, undated).

In South Africa, ensuring transparency and accountability for the funds for the electrification of the poor has been achieved by having fixed targets on the number of connections and monitoring the progress over a specified period. The progress of the connections and the expenditure on the electrification programme is closely monitored and reported by the independent National Electricity Regulator (NER) every year. These reports are available to the public in hard copy as well as on the NER website – an indication of a high level of transparency and accountability.

Sequencing of Reforms

Does sequencing matter? Is it best to embark on widescale electrification of the poor prior to privatisation or vice versa – privatising and thereafter launching an electrification programme? Although the “Energy Access” study was not designed to address this question, the findings of some of the regional studies provide some indication that the sequence of reforms is important.

In countries where widescale electrification was undertaken prior to market-oriented reform such as privatisation, notably: South Africa, Zimbabwe, Mauritius, Thailand and Philippines, it emerged that a significant proportion of the poor gained access to electricity. In South Africa, for example, in spite of having been liberated during a time when privatization of the power sector was sweeping across the African continent, market-oriented reforms such as privatization did not commence until after

²⁵ The term “ring-fencing” refers to ensuring that funds are strictly accounted for and protected from any misallocation.

substantial progress in electrification of the poor has been realized (Davidson and Mwakasonda, 2003).

Conversely, access to electricity among the poor in Kenya, Uganda, Senegal and Mali, appeared to be very low, partially due to the high priority given to market-oriented reforms such as privatisation while relegating electrification efforts to the back burner. In all these countries, the implementation of rural electrification initiatives began after the completion or towards the tail end of reforms.

Explicit Focus on the Poor

With the exception of a few countries, reforms in most of the countries examined in the “Energy Access” study, did not provide an explicit focus on the poor. This finding is shared by other analysts who argue that, generally, reforms were not designed to address the energy problems of the poor (Wamukonya, 2003; Byrne & Mun, 2003; Fall & Wamukonya, 2003; Agbemabiese, Byrne & Bouille, 2003; Lash, 2002; Bouille, Dubrovsky & Maurer, 2002; Dubash & Rajan, 2002; Edjekumhene & Dubash, 2002).

There are several ways in which reforms could ensure that the poor become a critical consideration of the reform process. Some examples are provided in the following sections from the findings of the country case studies of Brazil, Philippines, South Africa and Bangladesh.

One way of ensuring that reforms explicitly focus on the poor is by enacting laws that ensure they gain access to electricity. This was the approach adopted in Brazil which has three key laws focusing on the poor (Goldemberg, *et al*, 2003). One such law is Law 9,074 (1995) which decrees that electricity distribution concessionaires and “permissionaries” must provide comprehensive services to the market, without excluding low-income households and rural areas. Law 9,427 (1996) removes the burden of upfront electrification costs from the poor and transfers it to the concessionaires and “permissionaries”. This law is complemented by Law 10,438 (2002) which provides stringent procedures aiming at universal access to electricity.

An additional approach is ensuring that the Electricity Act (or relevant legislature) explicitly defines the poor and establishes provisions for increased access and at affordable electricity prices. This is the approach adopted in Brazil and Philippines.

In Brazil, Law 10,438 (2002) explicitly defines the poor and classifies them into two categories: the low income consumers with a monthly consumption of up to 80 kWh; and, “*customers under special conditions*” for those with monthly consumption of up to 220 kWh²⁶. This distinction helps in ensuring that the poor receive special benefits such as discounts on their electricity tariffs. For example, the poor consuming up to 30 kWh per month pay only 35% of the stipulated tariff while those consuming up to 100 kWh per month pay about 60% of the tariff (Goldemberg, *et al*, 2003).

In the Philippines, the Act makes special provisions for the poor – defined in the Act as ‘marginalised sector of the society’, in two ways: Firstly, the Act provides for an electrification fund to ensure increased electricity access among the poor. Secondly, it protects the subsidies provided in life-line tariffs for the poor for a period of 10 years (Sihag, *et al*, 2003).

²⁶ The classification of the poor generally applies in all regions but some regions have slight variations. For example, ANEEL – the regulatory agency, classifies consumers of 140 kWh/month in the state of Pernambuco as low income consumers.

Establishing dedicated institutions for the electrification of the poor is another way reforms could ensure an explicit focus on the poor. This approach appears to have been successful in Bangladesh and South Africa. In Bangladesh, the Rural Electrification Board (REB) was established with one of its key mandate being widening the people's access to electricity and ensuring poverty alleviation in the rural areas (Shrestha, *et al*, 2003). In South Africa, the National Electrification Programme was designed to target the formerly underprivileged group under the apartheid regime who constituted the majority poor.

Participation of the Poor in the Electrification Process

Apart from ensuring explicit focus on the poor, involvement of the poor in the electrification process appears to be equally important. With the exception of South and South East Asian countries, there appears to be limited involvement of the poor in other regions covered by the "Energy Access" study. There are three key approaches alluded to in the study that could encourage the involvement of the poor in the electrification process.

The most common approach, demonstrated by the experience in South and South East Asia, is through the establishment of Rural Electricity Cooperatives (Sihag, *et al*, 2003; Shrestha, *et al*, 2003). The cooperative approach can be effective in devolving electricity supply management to the local level, whereby local communities actively participate in the installation, operations, maintenance and expansion of the local electricity infrastructure. If appropriately designed and managed, the tariffs that the cooperatives collect can cover all operational costs and any loan repayments (Sihag, *et al*, 2003).

Enabling the poor to make some in-kind contributions such as providing labour for the construction of rural electrification civil works is another approach for involving the poor. This approach has been successfully demonstrated in other sectors such as the water and agriculture sectors.

Another effective way of involving the poor in the electrification process proposed by the East African study is by providing for their representation on the governing boards of the rural electrification agencies. The study suggests that such a move will ensure that the needs and priorities of the poor are adequately addressed by the electrification agencies (Karekezi, *et al*, 2003).

Lessons Learnt:

The various case studies assessed under the "Energy Access" Working Group appear to be at different stages of reforms as well as levels of electrification. This provides a useful opportunity for different regions to learn from each other. Specifically, the "Energy Access" study provides valuable lessons for sub-Saharan Africa (and, to some extent, South Asia) – the least electrified region which is yet to implement many of the reforms effected in other regions of the developing world.

An important lesson from the Asian case studies is that the sequencing of reforms is key - the establishment of structures and mechanisms for increased electrification of the poor particularly in rural areas, ought to be in place before (or at least at the same time as) initiation of large-scale market-oriented reforms such as privatization. Thailand and the Philippines, initiated market-oriented reforms such as privatization well after establishing independent rural electrification agencies that ensured rapid rural electrification.

Secondly, the poor should be involved in the electrification process to ascertain that their concerns are addressed. This could be undertaken through different approaches. As mentioned earlier, one way of involving the poor would be to ensure that the governing boards of the rural electrification agencies include representatives of the poor. Another approach that appears to have yielded positive results in Bangladesh is the rural electricity cooperatives approach. *Palli Bidhut Samity* (local cooperatives), ensured grass-roots participation and ownership of the electricity distribution infrastructure and management.

To ensure that the objective of increasing access to the poor is achieved, the funds for the electrification of the poor should be “ring-fenced”, in other words, protected. Brazil and South Africa provide good examples on how the protection of electrification funds could be undertaken.

The case studies focus on selected examples of reform and do not pretend to close the debate on the nature of energy sector reforms. Nevertheless, they do point to an overarching conclusion: when reforms are introduced with the sole intention of improving the performance of utilities, the expected and hoped for social benefits do not necessarily follow. Where governments have not maintained a role of instigator or at least regulator of improved access to electricity by the poor, tariffs have tended to increase, and levels and rates of electrification have tended to drop. This strongly indicates that if the interests of the poor are to be adequately protected in the reform process, their needs must be taken into account when designing reforms, and this must be backed by political commitment.

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AFREPREN

The African Energy Policy Research Network (AFREPREN) brings together 106 African energy researchers and policy makers who have conducted policy studies in 19 African countries. AFREPREN authored the Eastern Africa report for GNESD.

BRAZIL

Two Brazilian centres have joined forces to participate in GNESD. One team, in Rio de Janeiro, is within the Centre for Integrated Studies on Climate Change and Environment (Centro Clima). GNESD is hosted in São Paulo by CENBIO—the National Reference Centre on Biomass. These centres contributed the Brazil report.

ENDA-TM

Environnement et Développement du Tiers Monde (ENDA-TM) is a non governmental organisation based in Dakar, Senegal. Its objectives and activities contribute to a better technical, economic and socio-cultural understanding of energy issues in African countries. ENDA-TM provided the Western Africa report.

BARILOCHE FOUNDATION

The Bariloche Foundation is a private, non-profit institute founded in 1963 to further research, training, technical assistance, diffusion and other activities. It is based in San Carlos de Bariloche, Argentina. The foundation contributed the LA&C report.

AIT

The Asian Institute of Technology (AIT), based in Thailand, is an international postgraduate institution with a mission to develop highly qualified and committed professionals who will play a leading role in the sustainable development of the Asian region. AIT contributed the Thailand, Bangladesh and Vietnam case studies for one of the South and South East Asia reports.

EDRC

The Energy and Development Research Centre (EDRC)²⁷, based in South Africa, intends to be a leading-edge institution for development of African energy and energy-environment policy, development and capacity building. EDRC provided the Southern Africa report.

TERI

The Energy and Resources Institute (TERI), located in New Delhi, India, was established in 1974 with an initial focus on documentation and information dissemination. Research activities in the fields of energy, environment and sustainable development were initiated in 1982. TERI provided the India and Philippines case studies for one of the South and South East Asia reports.

ERI

The Energy Research Institute (ERI), part of China's National Development and Reform Commission, is the national, governmental energy economics and policy study institute. ERI's research fields cover a wide range of energy policy issues. ERI contributed the China report.

²⁷ Energy and Development Research Centre (EDRC) now Energy Research Centre (ERC).

Appendix 2: Power Sector Reform Options

1.0 Restructuring

Restructuring, also some times referred to as structural change, can be classified into two categories:

- Vertical Unbundling
- Horizontal Unbundling.

Vertical Unbundling

Vertical unbundling refers to the process of separating vertically integrated utilities into independent generation, transmission and distribution companies. This process often follows the following procedure:

Vertically integrated utility: The power utility undertakes electricity generation, transmission and distribution.

Unbundled generation, common transmission and distribution: The generation component of the utility becomes an independent entity while transmission and distribution remains a single entity.

Unbundled generation and distribution: In addition to the generation earlier unbundled, the distribution entity is separated from transmission.

Complete Vertically Unbundled: This is a state where three entities, i.e. generation, transmission and distribution are independent companies.

Horizontal Unbundling

Horizontal unbundling refers to the process whereby generation or distribution, undertaken by one monopoly utility are separated in order to be performed by more than one entity.

National utility: The power utility undertakes electricity generation, transmission and distribution nation-wide.

Provincial distribution companies, national generation and transmission: The national distribution component of the utility is reduced to entities at provincial level. Generation and distribution components remain at national level.

Provincial distribution and generation and national transmission (common carrier): In addition to provincial distribution entities, generation entities are also established at provincial level. Transmission, however, remains at a national level.

Complete horizontal unbundling (provincial utilities which are vertically integrated): This is a state whereby the each province owns a utility that undertakes electricity generation, transmission and distribution.

2.0 Privatization/Ownership Changes

Complete Government Ownership: This is a state whereby the Government owns all the generation, transmission and distribution assets at the disposal of the utility.

Ministry/Department: The power utility's parent Ministry/Department e.g. Ministry/Department of Energy, manages the utility directly and also makes the key capital investment decisions.

Parastatal: The utility becomes a state body with its own management with more powers to decide and implement investments with the parent Ministry/Department providing policy directives as well as approving investment decisions.

Corporatisation: The utility is accorded the status of a limited liability corporate body. As a corporate body, the utility may seek alternative financing through floatation of shares on the stock market or issuing bonds. However, Government may remain the majority shareholder.

Commercialization: The utility operates on commercial basis, ceasing to be a welfare-oriented organization. The utility would focus on profitability and reduce emphasis on its social objectives.

Contract Management: The management of the utility is contracted out to a private entity. The utility, however, still remains the owner of the assets.

Amendment of the Electricity Act: The National Assembly or Parliament of the country passes an amendment to the existing Act to establish new legislation governing the electricity or energy sectors. This, for instance, removes monopoly of a utility, a major barrier to private sector participation.

Establishment of an Independent Regulatory Body: An autonomous body is set up, according to legislative provisions, to oversee and regulate the activities of all players in the sector.

IPPs - Privatization of generation: The generation monopoly of the utility is dismantled, giving way to private investors to set up generating units that sell power to the utility. In a few cases, the state-owned generation assets are sold to private entrepreneurs.

Privatization of generation and distribution: Both generation and distribution entities are opened-up for private sector participation.

Privatization of generation, transmission and distribution: In addition to the generation and distribution, the transmission entity is also opened-up to private sector participation.

Complete Private Ownership: This is a state whereby all generation, transmission and distribution entities in the country are wholly in the hands of the private sector.

Appendix 3: Additional Details on the Selected Indicators

As mentioned earlier, it is recommended that each Centre uses the following five (5) indicators to assess the impact of the selected reform option:

Access

- i) National electrification levels
- ii) National electrification rates
- iii) Electricity consumption per capita

Affordability

- iv) Electricity tariffs
- v) Household electricity expenditure as a percentage of total household income

i) National electrification levels

Use of national electrification levels is probably the simplest indicator of electricity access. This indicator provides an estimate of the proportion of the population that has physical access to electricity. Electrification levels should not be confused with the indicator of electrification rate that is explained separately.

There are three ways to obtain data for this indicator. Firstly, from published national household surveys. Secondly, it can be derived from the total number of national utility customers. To derive this indicator, the total number of customers is multiplied by the average household size and then divided by the total population. This method has some flaws (for example, assumes that commercial and industrial customers are equivalent to households customers) but the resultant errors are usually not material. It is, however, difficult to find data sets where the customers are divided into two income categories (poor and non-poor)

Thirdly, is to use the national utility's data by identifying the number of customers per tariff classification of consumption bands. Here, one can make the assumption that customers in the first consumption band (usually 1-50 kWh or 1-100 kWh) are poor. Any other customer in any other consumption bands can be considered non-poor. Proxies must be used with caution and defined explicitly. The proxy for consumption in some cases is deceiving. For example, in Great Buenos Aires in Argentina, electricity consumption of the urban poor was around 150 kWh/month due to the use of obsolete equipment, bad coolers and heaters, etc (Bouille, Kozulj and Di Sbroiavacca, 2003).

Where data is available, Centres could assess electrification levels for the poor living below US\$ 1 a day and at US\$ 2 a day poverty lines.

Data Sets:

Country Case Studies	Indicator	Pre-reform, Year (%)	Post-reform, Year (%)
Country Case Study 1	Total electrification levels		
	Electrification levels of the poor		
	Electrification levels of the non-poor		
Country Case Study 2	Total electrification levels		
	Electrification levels of the poor		
	Electrification levels of the non-poor		
Country Case Study 3	Total electrification levels		
	Electrification levels of the poor		
	Electrification levels of the non-poor		
Optional additional indicators			
	Electrification levels of poor below US\$ 1 a day		
	Electrification levels of poor below US\$ 2 a day		

Note: If countrywide (or statewide) data is not available, data from a limited geographic zone could be extrapolated to derive national (or statewide) level data. Only countrywide (or statewide) data will be useful for comparison with findings of other Centres. The process of extrapolating data to national levels may be fraught with methodological problems. In addition, the unit of analysis should be the jurisdiction of the relevant reforming region, particularly for the case of India (Sihag, 2003). However, one may still draw useful insights if these complications are adequately highlighted, and their nature clearly explained.

ii) National electrification rate

The national electrification rate measures the pace of electrification (e.g. rate of new connections). This indicator can be used to determine the extent to which a particular reform option accelerates access to electricity especially among the poor.

The national electrification rates indicator can usually be obtained from the national utility's published reports, which provides the number of new connections. Similar to the assessment of electrification levels, electrification rates will be assessed at three levels:

- Electrification rates (national)
- Electrification rates of the poor
- Electrification rates of the non-poor

Electrification rates categorised by income group would probably be difficult to find but as mentioned earlier, several proxies could be used to derive acceptable estimates. For example, the number of lifeline connections or the number of customers within the lowest tariff category band could be used as a proxy for the poor. As mentioned earlier, proxies must be used with caution and defined explicitly. The proxy for consumption in some cases is deceiving. For example, in Great Buenos Aires in Argentina, electricity consumption cannot be adequately used to classify income groups (Bouille, Kozulj and Di Sbroiavacca, 2003).

Where data is available, Centres could assess electrification rates for the poor living below US\$ 1 a day and at US\$ 2 a day. In addition, where data is available, disconnection rates could be provided which could be an indicator of an adverse impact of a particular reform option.

Data Sets:

Country Case Studies	Indicator	Pre-reform, Year (%)	Post-reform, Year (%)
Country Case Study 1	National electrification rates		
	Electrification rates of the poor		
	Electrification rates of the non-poor		
Country Case Study 2	National electrification rates		
	Electrification rates of the poor		
	Electrification rates of the non-poor		
Country Case Study 3	National electrification rates		
	Electrification rates of the poor		
	Electrification rates of the non-poor		
Optional additional indicators to include			
	Number of disconnections (No.)		
	Disconnection rates		
	No. of households disconnected (No.)		
	Disconnection rates of households		
	Electrification rates of poor below US\$ 1 a day		
	Electrification rates of poor below US\$ 2 a day		

Note: If countrywide (or statewide) data is not available, data from a limited geographic zone could be extrapolated to derive national (or statewide) level data. Only countrywide (or statewide) data will be useful for comparison with findings of other Centres. The process of extrapolating data to national levels may be fraught with methodological problems. In addition, the unit of analysis should be the jurisdiction of the relevant reforming region, particularly for the case of India (Sihag, 2003). However, one may still draw useful insights if these complications are adequately highlighted, and their nature clearly explained.

iii) Electricity consumption

Another indicator for measuring the impact of reforms on electricity access of the poor would be electricity consumption levels before and after the implementation of a reform option. As mentioned earlier, this approach could have some inherent problems. For example, in the case of the urban poor in Argentina, their consumption was not measured before reforms because they were illegally connected, so some inferred estimations of their consumption levels could be made by looking at data on non-technical losses. Their average consumption was presumably high because they did not pay. After reforms, the regularization of these consumers was made with subsidies of the State. The consumption levels could be above the proposed proxy of 100 kWh/month tariff band for the poor. Therefore, taking a number of consumers in the range of 100 kWh/month before and after the reforms may not indicate any important change (Bouille, Kozulj and Di Sbroiavacca, 2003). As before, the electrification consumption will be determined, first at the national level, irrespective of income and, secondly, by income groups (i.e poor and non-poor).

At the national level, the national average per capita electricity consumption (kWh) can be obtained from three possible sources of this data: The first possible source are the World Bank “World Development Indicators” publication series. The second source would be the national utility data from which the estimates could be derived by dividing the amount of electricity consumed/sold by the population. Thirdly, published national household surveys could provide the requisite data sets.

The data by income groups could be obtained from national utility data as well as from the national household surveys. Utility data is likely to provide the average electricity consumption by consumption bands. Again, one assumption that could be made is that customers at the lower end of the consumption bands are poor. Secondly, published national household surveys could provide the average electricity consumption by income groups.

Data Sets:

Country Case Studies	Indicator	Pre-reform, Year (kWh)	Post-reform, Year (kWh)
Country Case Study 1	National average per capita electricity consumption		
	Average per capita electricity consumption by the poor		
	Average per capita electricity consumption by the non-poor		
Country Case Study 2	National average per capita electricity consumption		
	Average per capita electricity consumption by the poor		
	Average per capita electricity consumption by the non-poor		
Country Case Study 3	National average per capita electricity consumption		
	Average per capita electricity consumption by the poor		

Country Case Studies	Indicator	Pre-reform, Year (kWh)	Post-reform, Year (kWh)
	Average per capita electricity consumption by the non-poor		
Optional additional indicators to include			
	Average per capita electricity consumption by the poor under US\$ 1		
	Average per capita electricity consumption by the poor under US\$ 2		

Note: If countrywide (or statewide) data is not available, data from a limited geographic zone could be extrapolated to derive national (or statewide) level data. Only countrywide (or statewide) data will be useful for comparison with findings of other Centres. As mentioned earlier, the process of extrapolating data to national levels may be fraught with methodological problems. In addition, the unit of analysis should be the jurisdiction of the relevant reforming region, particularly for the case of India (Sihag, 2003). However, one may still draw useful insights if these complications are adequately highlighted, and their nature clearly explained.

iv) Electricity tariffs

Electricity tariffs can be used as an indicator of the affordability of electricity for various income groups. The complexity of real reform impact on the poor is not always reflected in the pricing or tariff policy, as shown in the case of Argentina. A tariff could be reduced in nominal monetary terms, but could have negative effects on the majority of the poor due to the distorted and unfavorable exchange rate (Bouille, Kozulj and Di Sbroiavacca, 2003). Three elements of tariffs can be assessed:

- Average tariff
- Connection fees/charges
- Introduction or removal of lifeline tariffs and/or free electricity consumption (in addition, changes in the amount provided under the lifeline tariff and/or free electricity consumption bands could be assessed).

The primary source of this data would be utility reports as well as tariff studies. Changes in average tariffs could provide an indication of the extent to which a reform option makes electricity consumption cheaper or more expensive for the poor. Changes in connection fees/charges could provide a proxy for increased or diminishing opportunities for new connections for the poor. Similarly, the introduction or removal of lifeline tariffs and/or free electricity consumption bands could significantly affect the poor's ability to pay for electricity services. Likewise, changes in the amount of lifeline tariffs and free electricity consumption bands could affect electricity consumption levels among the poor.

Data Sets:

Country Case Studies	Indicator	Pre-reform, Year	Post-reform, Year
Country Case Study 1	Average tariffs (USc/kWh)		
	Connection fees/charges (US\$)		
	Existence of lifeline tariffs (Yes/No)		
	Lifeline tariff charges (USc/kWh or fixed US\$)		
	Existence of free electricity consumption bands (Yes/No)		
	Amount of free electricity provided to the poor (kWh)		
Country Case Study 2	Average tariffs (USc/kWh)		
	Connection fees/charges (US\$)		
	Existence of lifeline tariffs (Yes/No)		
	Lifeline tariff charges (USc/kWh or fixed US\$)		
	Existence of free electricity consumption bands (Yes/No)		
	Amount of free electricity provided for the poor (kWh)		
Country Case Study 3	Average tariffs (USc/kWh)		
	Connection fees/charges (US\$)		
	Existence of lifeline tariffs (Yes/No)		
	Lifeline tariff charges (USc/kWh or fixed US\$)		

Country Case Studies	Indicator	Pre-reform, Year	Post-reform, Year
	Existence of free electricity consumption bands (Yes/No)		
	Amount of free electricity provided to the poor (kWh)		

Note: If countrywide (or statewide) data is not available, data from a limited geographic zone could be extrapolated to derive national (or statewide) level data. Only countrywide (or statewide) data will be useful for comparison with findings of other Centres. The process of extrapolating data to national levels may be fraught with methodological problems. In addition, the unit of analysis should be the jurisdiction of the relevant reforming region, particularly for the case of India (Sihag, 2003). However, one may still draw useful insights if these complications are adequately highlighted, and their nature clearly explained.

v) Electricity Expenditure of the Poor

Electricity expenditure is another measure of the impact of a reform option on the poor. The relevant data would be the average expenditure on electricity as a proportion of the household expenditure. Like all the other indicators, the requisite data sets will be provided at the national level as well as by income group. This data is likely to be found in national household surveys.

The impact of the reform measure is measured by the change in the proportion of electricity expenditure. An increase in this proportion after the implementation of a reform option could imply a negative impact (probably due an increase in tariffs or other electricity-related costs) whereas a decrease could depict a positive impact (perhaps as a result of a reduction in tariffs).

Data Sets:

Country Case Studies	Indicator	Pre-reform, Year (%)	Post-reform, Year (%)
Country Case Study 1	National average electricity expenditure as a % of total household expenditure		
	Average electricity expenditure as a % of total household expenditure of the poor		
	Average electricity expenditure as a % of total household expenditure of the non-poor		
Country Case Study 2	National average electricity expenditure as a % of total household expenditure		
	Average electricity expenditure as a % of total household expenditure of the poor		
	Average electricity expenditure as a % of total household expenditure of the non-poor		
Country Case Study 3	National average electricity expenditure as a % of total household expenditure		
	Average electricity expenditure as a % of total household expenditure of the poor		
	Average electricity expenditure as a % of total household expenditure of the non-poor		
Optional additional indicators to include			
	Average electricity expenditure as a % of total household expenditure of the poor below US\$ 1 a day		
	Average electricity expenditure as a % of total household expenditure of the poor below US\$ 2 a day		

Note: If countrywide (or statewide) data is not available, data from a limited geographic zone could be extrapolated to derive national (or statewide) level data. Only countrywide (or statewide) data will be useful for comparison with findings of other Centres. As mentioned earlier, the process of extrapolating data to national levels may be fraught with methodological problems. In addition, the unit of analysis should be the jurisdiction of the relevant reforming region, particularly for the case of India (Sihag, 2003). However, one may still draw useful insights if these complications are adequately highlighted, and their nature clearly explained.