

GNESD

**GLOBAL NETWORK ON ENERGY
FOR SUSTAINABLE DEVELOPMENT**

Facilitated by UNEP



Energy Access theme results

Summary for Policy Makers (SPM)

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About GNESD

The Global Network on Energy for Sustainable Development (GNESD) is a UNEP facilitated knowledge network of industrialized and developing world Centres of Excellence and Network partners, renowned for their work on energy, development, and environment issues. The longer-term result of GNESD is to enhance the capacity of national institutions in developing countries to develop policies and undertake planning and research efforts that integrate solutions to energy, environment and development challenges. Member Centres are as of April 2004:

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- Environnement et Développement du Tiers Monde (ENDA-TM), Senegal.
- The African Energy Policy Research Network/Foundation for Woodstove Dissemination (AFREPREN/FWD), Kenya.
- The Energy Research Centre (ERC), South Africa.

Europe

- AEA Technology, Future Energy Solutions (FES), UK.
- KFA Forschungszentrum Jülich, Germany.
- The Department of Energy and Environmental Policies (EPE), Production and International Integration Economics Laboratory (LEPII), Université Pierre Mendès-France, Grenoble, France.
- The Energy Research Center of the Netherlands (ECN), The Netherlands.
- The Fraunhofer Institute for Solar Energy Systems (ISE), Germany.
- The International Institute for Industrial Environmental Economics (IIIEE) at Lund University, Sweden.
- UNEP RISØ Centre (URC), Denmark.

North and South America & the Pacific

- The Institute for Energy Economics at Fundación Bariloche (IDEE/FB), Argentina.
- The National Renewable Energy Laboratory (NREL), USA.
- The Stockholm Environment Institute's Boston Center (SEI-B), USA.
- The University of the South Pacific (USP), Fiji.
- CentroClima at the Federal University of Rio de Janeiro and CENBIO at the University of São Paulo in conjunction, Brazil.

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- Institute of Energy Economics (IEEJ), Japan.
- The Asian Institute of Technology (AIT), Thailand.
- The Energy and Resources Institute (TERI), India.
- The Energy Research Group (ERG) at The American University of Beirut (AUB), Lebanon.
- The Energy Research Institute (ERI) of the National Development and Reform Commission (NDRC), China.

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

Summary For Policy Makers

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Background

Efficient, affordable and reliable modern energy services are recognised as essential for sustainable development. Yet almost half of the world's population does not have access to modern energy supplies and many people still rely entirely on traditional biofuels, with all of the health and environmental problems which that entails (Box 1).

Over the past two decades, developing countries have attempted to address this issue. In doing so they have often implemented market-led energy sector reforms that involve restructuring of their publicly-

Box 1: Reliance on traditional biomass

Collecting traditional fuels each day, primarily carried out by women and children, uses up time that could be spent on more productive activities such as education or generating income. Those reliant on traditional fuels also face larger amounts of indoor pollutants from open fires, causing respiratory disorders, especially among women and children who tend to spend more time indoors. Collection and use of biomass also have adverse environmental effects including deforestation, erosion, and water and air pollution.

Biomass as percentage of residential energy consumption in Western African countries

Country	Biomass in energy consumption (%)
Burkina	87.1
Niger	80.6
Togo	71.9
Senegal	56.2
Benin	89.2
Guinea	74.2
Mali	88.9

Source: World Human Development Report 2002, in ENDA Report

owned, highly integrated utilities and increased private sector participation. Impetus was given to this approach by major international funding agencies, which often required restructuring as a condition for loans.

The reasoning behind such initiatives was simple: streamlined and restructured energy sectors, being more efficient and less costly, would widen access to energy services and produce benefits for health, education, nutrition and entrepreneurship for all. In this context, the role of government is reduced to creating an enabling environment within which private sector mechanisms develop and provide services.

However, evidence is accumulating that in many cases the reforms have not produced the expected results and that, in particular, the poorer members of society remain excluded from modern energy services. An area of special concern is an apparent deterioration in available services in some areas where reliance on traditional biomass fuels is actually increasing. This is particularly true of sub-Saharan Africa, parts of Latin America and the Caribbean, and South Asia.

A number of experts have suggested that this situation is the result of the nature of the reforms introduced. They argue that the focus of market-led reforms on improved efficiency with a reduced role for governments and no direct programme focused on increased access could not, from the outset, address the energy problems of the poor.

Analysing the issues – the Global Network on Energy for Sustainable Development

The first theme analysed by the Global Network on Energy for Sustainable Development (GNESD) is “Energy Access”, with a primary objective of identifying viable and proven policy options in rapidly reforming energy sectors that provide cleaner and more sustainable energy services to the world’s poor. Eight developing-world Centres of Excellence participated in the “Energy Access” Working Group with a limited total budget of US\$183,000. The Centres cooperate mainly via the GNESD website to access GNESD publications and contribute to the theme work. These Centres are all renowned for their work on energy, development and environmental issues.

A sub-regional perspective

The GNESD has examined the issues outlined above by conducting investigations of the impact of sectoral reforms on energy access for the poor in eight sub-regions: Brazil; China; Eastern Africa; Latin America and the Caribbean (LA&C); Southern Africa; Western Africa; and South and Southeast Asia (2 reports). 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. The work was carried out by a GNESD Working Group on Energy Access made up of representatives from participating Centres of Excellence. Box 2 gives some background on GNESD; the Centres of Excellence involved are presented in Appendix 1.

Box 2: GNESD

GNESD, launched at the 2002 World Summit on Sustainable Development, aims to promote environmentally sound energy services supporting sustainable development through policies and solutions that expand the poor's access to sound energy services. GNESD's core consists of "Centres of Excellence" in developing countries noted for their work on energy, development and environmental issues.

The work addresses two basic questions:

- How have energy policy reforms addressed the "Energy Access" challenge facing the poor and how have they contributed to the growing problem of inadequate energy services for the poor in the developing world?
- Based on a rigorous analysis, what are the proven policy options that lead to improved, cleaner and more sustainable energy services for the poor in developing countries?

Attempts have been made in the past to study the impacts of energy sector reforms, but most of these have focussed on the consequences for performance of power utilities and, to a limited extent, on the impact of reforms on electricity tariffs. Studies to date have not attempted to assess the impact of reforms on the poor or to provide empirical evidence of such impacts. The investigations of the Centres of Excellence have resulted in detailed case studies intended to fill that important gap. The case studies throw light on the complexity and diversity of the real world situation, contrasting frequently with the "one size fits all" approach often proposed to developing countries in recent years by major donor agencies.

A common framework – ensuring comparable findings

To ensure that the Centres' findings would be comparable and to facilitate making useful recommendations, the Centres agreed on a broad common approach and on a set of indicators.

Focus on electricity

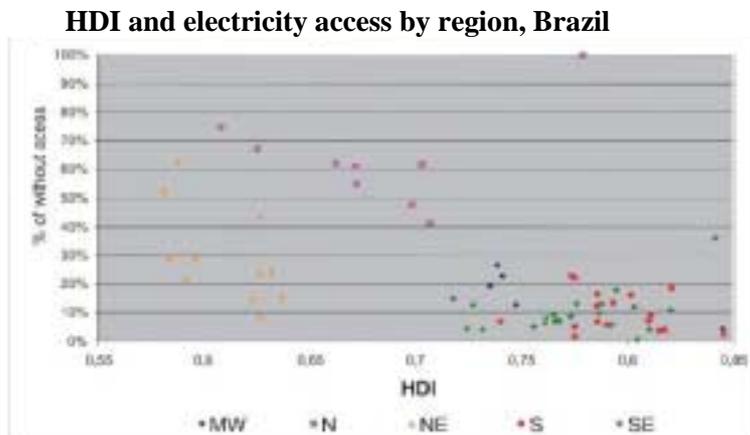
Each Centre focussed on the electricity sub-sector. From a global point of view, aggregate data for 2000 show that around 27 per cent of the world's population (i.e. 1.6 billion people) still do not have access to electricity; that more than 99 per cent of those without electricity live in developing countries; and four out of five live in rural areas. The table below gives a regional overview of the situation.

Electricity access: a regional overview, 2000

Region	Population Without Electricity (millions)	Population With Electricity (millions)	Electrification Level (%)
Developing Countries (total)	1634.2	2930.7	64.2
Africa	522.3	272.7	34.3
Developing Asia	1041.4	2147.3	67.3
Latin America	55.8	359.9	86.6
Middle East	14.7	150.7	91.1
Transition Economies	1.8	351.5	99.5
OECD	8.5	1108.3	99.2
World	1644.5	4390.4	72.8

In Africa, more than 83 per cent of the rural population lacks access to electricity. This rises to 92 per cent for sub-Saharan Africa; the figure for South Asia is 70 per cent. At the rate of connections of the past decade, it would take more than 40 years to electrify South Asia and almost twice as long for sub-Saharan Africa.

Energy poverty goes hand in hand with general poverty and, as illustrated by the figure below, from Brazil, the areas that lack access to electricity are also those where the Human Development Indexes (HDI) are lowest.



Electricity for basic services such as lighting and cooking can free people from the arduous and time consuming burden of collecting traditional biofuels, leaving more time for educational or other productive activities. It can also open a window to the rest of the world via media access.

When supplied at higher power levels, electricity provides the energy required for the development of directly productive agricultural or industrial activities that generate income. This point is of major importance. If people are to be lifted out of the poverty trap they need to be given the potential to increase their income. It is having an income which will, ultimately, allow the poor to pay for the energy services that underlie development, and thus allow them to become fully incorporated into the development process.

The indicators

Five indicators were selected by the GNESD Centres of Excellence 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.
- 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.
- Electricity consumption per capita: 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

If, as the case study from South Africa suggests, “electricity access is a function of income”, a comparison of its price prior to and following reforms, as well as observation of the proportion of household budgets that have to be used to pay for it, are key indicators in assessing the effects of reforms.

- Electricity tariffs: when combined with income data, tariffs can indicate to what extent various groups in society can afford electricity.
- Electricity expenditure: household expenditure for electricity as a proportion of total household income is an indicator of the burden which access and use of energy services can place on the budgets of poorer households.

Availability of information – identifying the “poor”

As the main focus of the analysis 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 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”.

Virtually all of the case studies stress that the lack of data sets dividing energy consumers specifically into “poor” and “non-poor” categories is a hindrance to the gathering of reliable empirical data on electrification. For some authors, this is interpreted as a strong indication that the poor have generally been overlooked in the reform process. The Eastern Africa report describes it as a “*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. It is recommended that, in future, each Centre should collate reliable data on electricity, categorised by income group.

In addition, some case studies (e.g. LA & C) show an increase in urban poverty. They indicate that this is bringing its own problems in terms of energy access, different from those resulting from or accompanying rural poverty, but that, to date, the phenomenon has been largely ignored.

The scarce attention paid to the energy problems of the urban poor may be due to the fact that the magnitude of the challenge has only recently become apparent. Urban poverty appears hand in hand with the very processes of urbanisation and modernisation that were supposed to put an end to poverty. Unlike poverty in rural areas—which often constitutes part of a traditional way of life—urban poverty frequently implies a lack of the equipment necessary for a modern way of life, implying that lack of access to energy in the urban situation can mean a more restricted range of options for meeting the most basic needs. In other words, when faced with lack of adequate and stable monetary income, the urban poor may suffer greater shortages than the rural poor, or the shortages may be different in nature. Urban poverty is a complex phenomenon and a problem that is difficult to resolve. However, in highlighting and providing empirical data on the issue, the investigative efforts made in this phase of the study have opened up new challenges and questions for future research.

The reforms – an overview

Prior to reform, a fairly typical pattern of organisation in the electricity sector was for a government to own, operate and regulate the sector, and to maintain substantial tariff subsidies for medium- and low-income consumers.

As illustrated by the example in Box 3, this model has been challenged in recent years. The traditional pattern, it was argued, prevented countries from financing the new generating capacity needed to keep pace with economic growth and the resulting increase in energy demand. Governments that were supporting subsidies would inevitably be unable or unwilling to introduce the tariff increases needed to cover the true costs of supplying power, and their utilities could only become increasingly dependent on bailouts from government or other sources.

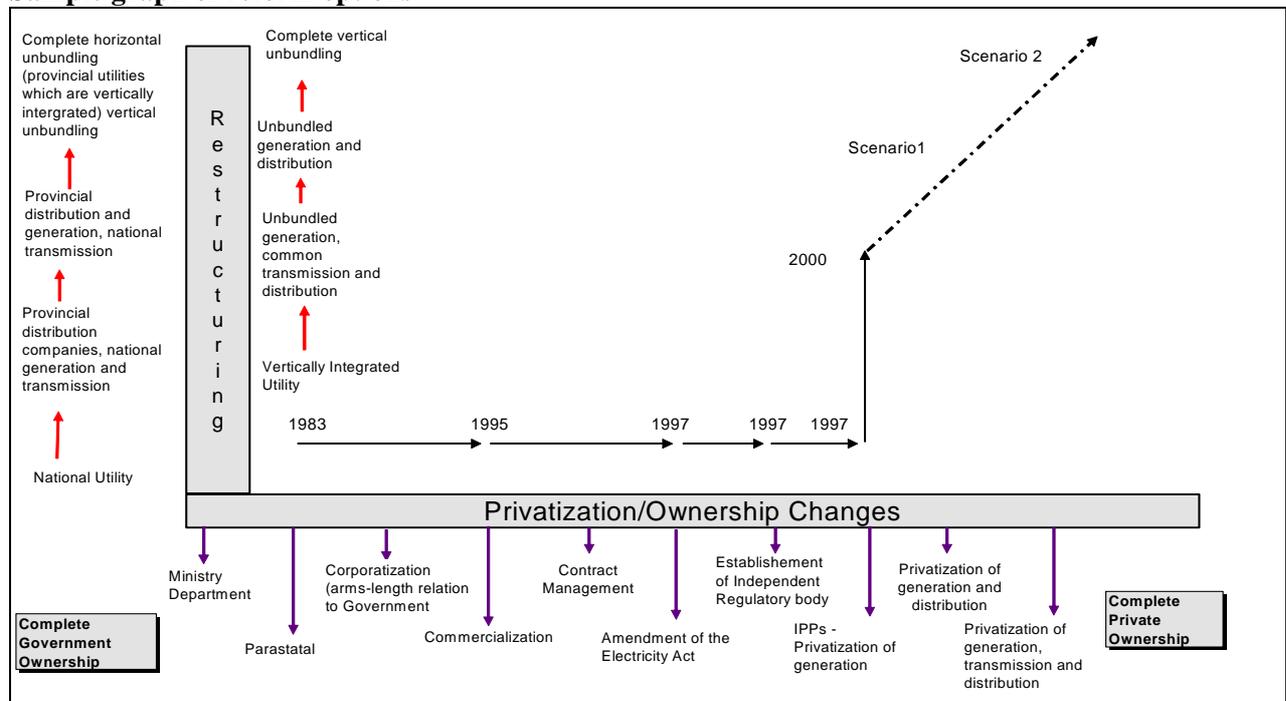
Box 3: Pressures for energy sector reform in Uganda

By the late 1980s, a combination of poor maintenance, limited re-investment and civil strife had run down Uganda's energy sector. In 1997, the government introduced a Strategic Plan to develop a financially viable electricity industry that would provide reasonably priced and reliable power. The Strategic Plan stressed the role of competition in promoting efficiency and of private sector participation as a key driver to enhance the performance of the country's electricity sector.

Developing countries accordingly instituted a variety of reforms based on the new, market-led model, using a mix of measures from “unbundling” their utilities (i.e. separating their different functions) to complete private ownership.

To ensure a common understanding of the reform options examined in the GNESD case studies, the Centres of Excellence adopted a standard terminology and, when relevant, drew up graphs based on the model shown below for the countries studied.

Sample graph of reform options



The terms used in the graph and in the following case study summaries are explained in Annex 2. In the context of the case studies, the term “reform” should be understood in its wider sense, referring to any major changes to the institutional structure of the electricity industry or any important management change aimed at improving the poor's access to electricity.

Case study findings

In spite of the search for a common approach, the case studies presented below had to adapt to diverse degrees of availability of information, and had to be creative with regard to the criteria used to adapt the proposed indicators for assessment of the impacts of energy reforms on energy access by the poor.

The case studies cover selected reform options that have been applied in a wide variety of economic and demographic situations, as well as covering different changes to the structures of electricity

industries and to the legislation governing them. In spite of this broad sweep, they nevertheless provide empirical evidence for the view that, when introducing reforms, governments have shown little commitment to improving the poor's access to electricity, and that without such commitment, market-led reforms have not generally benefited the poor or have even been harmful to them.

In summary, reforms have tended to have detrimental effects on electricity access by the poor in East Africa (Kenya and Uganda); West Africa (Mali and Senegal); Brazil; Latin America and the Caribbean (Argentina, Peru and El Salvador); and in parts of South and Southeast Asia (India).

They have been successful in improving electricity access for the poor in Southern Africa (South Africa and Zimbabwe); China; and in some cases in South and Southeast Asia (Philippines, Thailand and Vietnam).

Privatization of the power sector is a common type of reform in some of the countries where effects have been detrimental to the poor, whereas a focus on rural electrification is common among those that exhibit some success in increasing access to electricity for their poorer citizens.

East Africa¹ – Kenya and Uganda

Poverty levels are very high in Eastern Africa as a whole, particularly in rural areas where the majority of the population lives. Household electrification levels are very low with all countries in the sub-region (except Mauritius) having levels below 15 per cent.

The electricity industry in Eastern Africa is 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.

Status of power sector reforms in Eastern African countries (2003)

Reform Measures	Mauritius	Ethiopia	Tanzania	Kenya	Uganda
Amendment of the Electricity Act		Y		Y	Y
Corporatisation/Commercialisation		Y	Y	Y	Y
Establishment of Independent Regulator				Y	Y
Restructuring (unbundling)				Y	Y
Independent Power Producers	Y		Y	Y	Y
Privatisation of Generation					Y*
Privatisation of Distribution					?

Notes: * Concession awarded to Eskom (South Africa) in 2002. Concession agreement yet to be concluded following disagreement over concession terms between Government and proposed concessionaire

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.

¹ East Africa here refers to Kenya and Uganda. Eastern Africa, used below and elsewhere in this summary, refers to Ethiopia, Kenya, Uganda, Mauritius and Tanzania.

The reforms in Kenya and Uganda appear to have been detrimental to the electrification of the poor, 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 increases 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. In both countries, limited initiatives aimed at increasing rural electrification appear to have started only at end of the reform process.

In their search to improve electricity performance and attract foreign investment, reforms have so far failed to integrate increased public benefits such as rural electrification into their improvement strategy. 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 setting up of a rural electrification agency; incorporation of off-grid solutions; introduction of fiscal exemptions for connections; and introduction of a lifeline tariff. Uganda is in the process of creating an Electrification Board to extend rural connections and to extend use of mini-grid and PV systems.

Key findings and recommendations

- At present, data in both countries are scarce, making it difficult to devise appropriate policies. Databases should be developed to keep track of electrification of the poor.
- Safeguards should be introduced to avoid “cherry picking” by private investors. For example, electrification targets could be made a prerequisite for the purchase of attractive distribution rights.
- Reforms should ensure that tariffs are affordable by the poor. In particular, fixed charges and connection fees should be minimised.
- 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 adequately addressed.
- Finally, countries whose reforms are not at an advanced stage should make provision for increased rural electrification before embarking on large scale privatisation.

Southern Africa – South Africa and Zimbabwe

The average level of access to electricity in Southern Africa is around 20 per cent. However, this figure does not reflect the major differences that exist between countries: less than 7 per cent for Angola, D.R. Congo, Lesotho, Malawi and Mozambique; 20 per cent for Zimbabwe; and almost 70 per cent for South Africa.

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 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 dependent on donor funding. Both countries have used a mixture of grid and off-grid systems. The initiatives have shown improvements in overall levels of access, though at different rates in the two countries.

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 more than 3 million connections made since 1994. The focus was on previously disadvantaged and rural areas and on schools and clinics.

An off-grid scheme (photovoltaic systems) was launched in 1999, aiming to provide 350,000 solar home systems (SHS). A further programme provided photovoltaic (PV) systems to schools and clinics.

Reforms in Zimbabwe's electricity sector began when the country gained independence in 1980. Unlike South Africa, Zimbabwe's reform was financed mainly by external sources and only later used internal measures to raise capital. The latest round of reforms began to be institutionalised in 1999, with the government 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 have been 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 1980 to 42 per cent in 2001. With around 85,000 SHS installed under a Global Environment Facility (GEF) project, Zimbabwe is also one of the countries with the largest number of SHS in Africa.

The governments of South Africa and Zimbabwe have taken steps to address specific issues relating to poverty. South Africa has used specific tariffs, while Zimbabwe established the rural electrification fund, mentioned above, to assist rural development schemes as well as maintaining lifeline tariffs.

In 2002, South Africa introduced a direct subsidy to the poor in the form of a "poverty tariff". Under this scheme, 20–50 kWh per month of electricity are provided free to the poorest sector of the population. A recent evaluation of the areas where this has been provided noted, amongst other benefits, an increase in average monthly household incomes, with 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 also report 33 per cent of households starting to use appliances they were previously not able to use.

As shown in the table below, Zimbabwe has introduced lifeline electricity tariffs giving preferential pricing to domestic consumers with lower consumption, and even the flat rate of Z\$3.21 per kWh charged to higher consumers (over the 1000kWh block), is less than the Z\$4.13 per kWh that would actually be required to meet the cost of service and system expansion. Subsidies also extend to connection fees, with ZESA charging below the actual connection cost. ZESA's total annual subsidy to electricity is reported to be around 53.51 per cent of its total revenue.

Domestic consumption and subsidies		
<i>Consumption block</i>	<i>Tariffs/kWh (Z\$)</i>	<i>Tariffs/kWh (US \$)</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

The off-grid schemes implemented in the two countries have had a mixed reception. In South Africa, rural beneficiaries 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 systems installed between 1996 and 1998, only 6 per cent were operational in 2000. In Zimbabwe, about 30 per cent of the SHS installed under the GEF project failed within two years of installation.

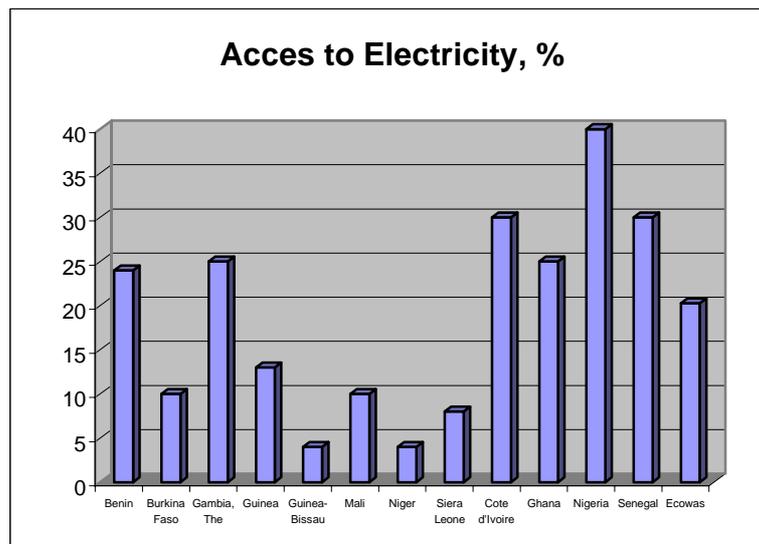
Key findings – the way forward

The study of South Africa and Zimbabwe has identified several areas that require further investigation. These can be summarised as follows:

- In general, electricity access is a function of income. If access to electricity by the poor is to be improved the overall cost of access needs to be reduced. This will require technological approaches to reduce connection fees, technical and non-technical losses, and distribution costs.
- The use of renewable energy, especially SHS as a poverty alleviation tool needs proper investigation. The importance of education, adequate training and information to the poor are crucial in realising any expected benefits

Western Africa – Senegal and Mali

Electrification in Western Africa remains very low. Annual per capita consumption varies greatly between countries, from around 350 kWh in Ghana to 27 kWh in Burkina Faso. Access to electricity in the Economic Community of West African States (ECOWAS) taken as a whole is limited to 20 per cent. In Côte d'Ivoire, Nigeria, and Senegal it ranges from 30 to 40 per cent, and is as low as 4 per cent in Guinea Bissau and Niger. In addition to this disparity between countries, individual countries show wide differences in levels of access to electricity between their urban, peri-urban and rural populations.



Electricity sector reforms were adopted at significantly different times from one country of the region to another. Côte d'Ivoire was the first to adopt reform, in the early 1990s. It was followed by Senegal, Mali, and The Gambia, and finally by Benin, in 2003. In all of these cases, the objectives of the reforms were clearly technical (renovation and extension of the grid, improvement of the quality of electricity) and financial, or were related to management. None of them made explicit mention of tackling poverty, in spite of the fact that many of the countries have listed poverty reduction as one of their national priorities.

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.

The key elements of reform in the two countries included:

- Private sector participation in the two existing state-owned utilities, expected to make profits for their shareholders.
- 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, overall electrification rates showed an increase in the post reform period, with growth of 8 per cent compared to 5.8 per cent in the 1990–1998 period. However, the trend for the “UDS” category of users (“special domestic users”, considered as poor for the purposes of this case study) showed an opposite downward trend—a clear indication that the reforms in Senegal have not helped poor people in gaining access to electricity.

In Mali, the national electrification level rose substantially after reform. However, this can mainly be attributed to connection of many households in urban areas (after a promotional campaign). Urban connection levels rose fairly sharply, while rural levels stagnated.

Key findings and recommendations

- The reforms that have been undertaken have not been sufficiently implemented, or have not been implemented long enough for definitive conclusions to be drawn. What is certain,

however, is that they have not yet resulted in a significant improvement in electricity production, nor even in a rise in per capita consumption or in the quality of supply, nor have they led to a drop in the cost of electricity. The most visible effect has been the creation of new bodies to regulate the sector or to take responsibility for rural electrification. The poor, who stand to be the main beneficiaries of rural electrification, have suffered from the delay in releasing specific funds to support reform and in incorporating a social and economic dimension.

- The rural population is assumed to be poor. Most of them have seen some increase in the price of a unit of electricity since reform. The low accessibility for households is largely due to difficulties in meeting subscription charges. It is difficult for low-income consumers to adopt the habit of setting money aside for a monthly outlay.
- Mechanisms should be put in place to facilitate access of the poor to electricity. Subsidies should be set in accordance with poverty levels and user profiles.
- Given the importance of women's activities in Senegal's economic fabric, it would be useful to conduct a study on energy and gender in order to get a clear understanding of how women's access to electricity is progressing, especially in the small-scale commercial production sector.
- It is recommended to assess all of these important issues through two main measures:
 - (1) The setting up of a dynamic energy/poverty observatory in order to direct the subsidies towards the most deprived areas and towards productive use.
 - (2) Conducting further study of:
 - (i) The level of user satisfaction
 - (ii) The extent of clandestine connections.

It will also be necessary to:

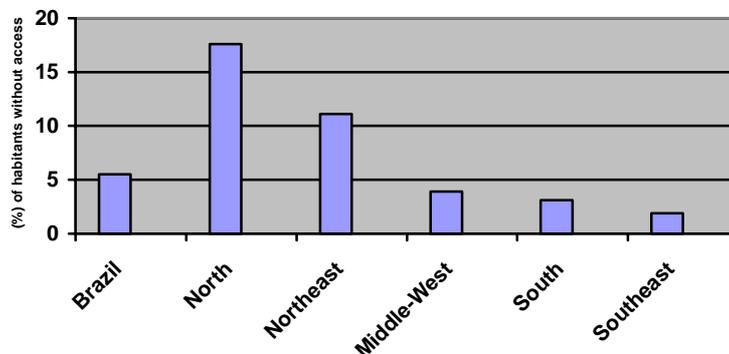
- (i) Validate the study at sub-regional level in West Africa by broadening it to include more case studies so that meaningful and widely-applicable results can be gleaned for the whole region.
- (ii) Establish and monitor indicators to measure the relationship between access to electricity and poverty; this will give a better idea of the impact of reforms on marginalized populations.
- (iii) Produce a synthesis report from the conclusions, recommendations and success stories, to position the study to influence reform debates and agendas in their design and implementation.
- (iv) Generate the material needed to provide effective assistance to decision-makers, regulators and energy planners, as well as to research and training institutions in their work activities and in the exercise of their responsibilities.
- (v) In order to take account of the different levels of poverty in the region, attempt to cover the category of poor households that cannot afford electricity and that rely on traditional fuels to satisfy energy needs.

Brazil

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, rural electrification levels vary from 96 per cent in Santa Catarina

(in the south) to 0.8 per cent in Pará (in the north). The figure below shows these geographical differences clearly.

Regional differences in access to electricity in Brazil



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 obligations of concessionaires. 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, 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 per cent above inflation, after the introduction of reforms in 1995. 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 for the poor.

There is now a consensus of opinion 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 a framework of legal and regulatory instruments.

Together with other 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, a further law made concessionaires responsible for the cost of providing services to new customers. Customers only have to meet tariffs. 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 allows new customers to accelerate connection by advancing a part of the cost, with an obligation on the concessionaire to reimburse when the target deadline for electricity has been met. Enforcement of this legislation is considered to be of key importance in overcoming barriers and achieving universal electrification.

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: tariffs have not reduced due to competition (in fact, substantial increases have affected poorer consumers); and the government has not been able to withdraw from investment in the energy sector.
- Attempts have been made to overcome difficulties, including grid extension and renewables programmes.

China

China has an estimated 28 million poor people when measured against the national poverty line, and most of these people 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.

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—market-economy style management was adopted for the operation of China's electricity industry. 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 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.

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.

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. This will make use of hybrid (PV/battery) systems as well as small hydro, solar and wind technologies, distributed as shown in the table below.

Distribution of power sources in the National Township Electrification Programme

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

*Power from wind turbines

China has identified a number of factors requiring attention if the long-term viability of these 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 the 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 creates 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, failure of the system is almost inevitable.

Key findings and future prospects

- China's efforts in extending grid connections and tariff reforms in the country's poorest areas have increased electrification level and electricity consumption in those areas.
- 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.

Latin America and the Caribbean

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 these people could be considered destitute. Many poor people find it difficult to access energy sources and, when they do have access, have difficulty in maintaining continuous and regular supply. This is particularly true of the electricity sector and is due, to some extent, to the impact of macro-economic reforms on poverty and to reforms in the sector.

In LA&C, the proportion and number of poor people in urban areas in relation to the total population 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, by 1999 the proportion had risen to 63.5 per cent. Paradoxically, considerations of energy and poverty have most often focused on the problems of the rural poor.

Where electricity is concerned, this is partly due to the fact that illegal connections tended to be ignored when the service was provided by state-run companies. Privatisations 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 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.

Radical reforms have been implemented in the energy sectors of some LA&C countries. When considering these, it must be borne in mind that structural changes in the sector often took place in a context of macro-economic reforms that affected the economic situation of consumers deeply and, generally, 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.

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 table below. Where electricity consumption in household is concerned, there was a decline in Peru, stagnation in El Salvador and an increase in Argentina. Despite these results for household sector, the national average of per capita electricity consumption (KWh/month) increased after reforms as a consequence of the growth in the industrial and services sectors as shown in the following table.

Comparison of results of analysis of selected indicators for the Argentina, El Salvador and Peru 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 % a.a.	4.1 % a.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 U\$S	4.35	11.77	6.8	17.2	4.8***	8.6****- 16.8*****

In Argentina, data indicate that the proportion of expenditure for electricity in household budgets increased after reforms. 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 aiming to increase the numbers with access to basic public services. Total losses also increased sharply in the pre-reform period and then gradually decreased by 1999, possibly indicating that, as in other LA&C countries, migration to urban areas was accompanied by illegal connections which were regularised after reform.

As in Argentina, tariffs in Peru underwent substantial increases in the post-reform period, while household consumption declined sharply.

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 low-income sectors most. The overall access level stagnated in the post-reform period.

Key findings and related issues

- The data compiled indicate that at national levels, service expansion has shown a marked decline since the reforms in the three countries.
- Provision of energy to rural areas at levels that would improve the productivity of the activities of rural people could help to prevent migration of rural poor to the cities. This may be more costly in the short-term, but it will ensure long-term returns.
- 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.
- A decade after the introduction of reforms in these three countries, issues of the role of the state, of subsidies, and of the most desirable types of solution remain. In coming decades, the debate will no longer focus on the convenience or otherwise of subsidising poor users, but on the most effective ways of expanding services to areas where they do not exist.

South and South East Asia – Thailand, Bangladesh and Vietnam

Electrification levels in South Asia vary between 15 and 62 per cent of the population; for South East Asia levels vary from 5 to 100 per cent. As shown in the table below, levels in the different countries in the sub-region vary widely, from a maximum of 100 per cent in Singapore to a minimum of 5 per cent in Myanmar.

Access to electricity and per capita consumption in South and South East Asia*

Region	Country	Electrification level (% of population)*	Per capita electricity consumption in 1999 (kWh/capita)
South Asia	Bangladesh	31.0 (2000)	96 (2002)
	India	43.0 (2000)	379
	Nepal	15.4 (2000)	47
	Pakistan	52.9 (2000)	321
	Sri Lanka	62.0 (2001)	255
Southeast Asia	Cambodia	15.8 (1998)	78 (1999)
	Indonesia	53.4 (2001)	345 (1999)
	Laos	33.0 (2002)	113
	Myanmar	5.0 (2000)	71
	Malaysia	90.0 (2000)	2,474
	Philippines	54.0 (2002)	454
	Singapore	100.0 (2000)	6,641
	Thailand	98.5 (2002)	1,448 (2002)
Vietnam**	77.4 (2001)	285 (2001)	

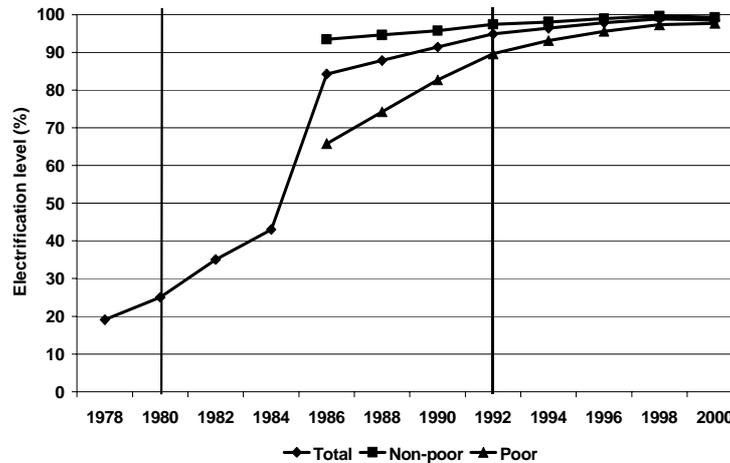
*Year mentioned in the bracket; **Percent of rural household population

Thailand, Bangladesh and Vietnam have taken steps that have increased 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 Vietnam².

In the early 1970s, only 7 per cent of poor households in Thailand had access to electricity. As shown in the figure below, this had increased to 98 per cent by 2000.

² In the absence of disaggregated data by income level, rural households are considered as a proxy for the poor while urban households are considered as 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 while households in municipal areas or those with monthly electricity consumption above 150 kWh are considered as non-poor depending upon indicators used.

Increasing electrification levels in Thailand



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 IPPs and SPPs to generate power in the country and allowed EGAT to engage in energy-related business activities. This major structural reform coincided with a series of tariff adjustments that resulted in a steady upward pressure on tariffs. However, neither the EGAT Act nor the tariff reforms seem to have adversely influenced the already very high electrification level, although the growth rate for 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, 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 *Palli Biddut Samity*, customers are members of a cooperative that 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 percentage of poor households with access to electricity to nineteen. 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, beyond the reach of many poor people.

In Vietnam, the government consolidated all electricity sector activities under Electricity of Vietnam (a management holding company) in 1995. Electricity of Vietnam (EVN) then set up a special office for rural electrification. The rural electrification department was part of EVN.

Electrification levels for the poor increased from 50 per cent in 1993 to 77 per cent in 2001. A variety of management approaches was used, the most common being the sale of electricity by power companies to local units which take responsibility for services from then on.

Vietnam has experienced regular (annual) tariff increases since the time of the reform. 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.

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

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. On the other hand, recent tariff reforms in Thailand focussing on greater economic efficiency have resulted in higher average price of electricity for both the poor and the non-poor.
- Lack of availability of data on electricity access and expenditure per 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 database.

South and South East Asia – India and the Philippines

India and the Philippines have implemented reforms in their energy sectors in recent years. The reform process in India did not make any provision for enhanced access to electricity by the poor, 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 influxes of private capital to create additional generating capacity, 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.

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, reform 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 the post-reform period, the three 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.

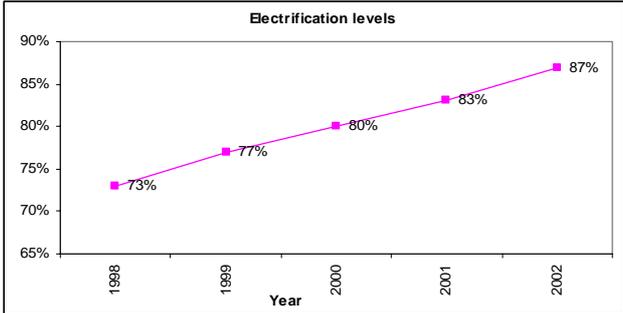
The Philippines government began considering reforms in the late 1990s, to pave the way for privatisation of its national power corporation (NPC). In June 2001, the Electric Industry Reform Act was passed. This mandated restructuring of the electricity industry and privatisation of the state-owned NPC as well as laying the foundations for privatisation of the existing Rural Electrification Corporations (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 customer, a process which will require some shift in existing subsidies. However, this is to be done gradually over three years—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 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 “barangay” (villages). Inhabitants of the barangay 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, the post-reform period has seen substantial growth in electrification levels of barangays (used here as a proxy for impact of the effects of reform on the poor).

Overall electrification levels in barangays



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 1, 000 per year, double the average accomplished prior to the O Ilaw programme.

Key findings

- Electricity reform in India has, unfortunately, invariably 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.

Some common themes

Despite the wide differences in the economic, political and demographic situations of the countries studied, comparison of the case studies reveals some common themes.

In most cases, market-led reforms with strong requirements regarding 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 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 adjust tariffs, these have risen. Tariff increases 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 proved to be a barrier. Connection charges are often far beyond the reach 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 therefore usually poorer, user.

Some countries have turned to renewable energy technologies (RETs) as a potential decentralised solution to solving the problem of delivering services to isolated areas remote from the grid.

Planners, notably in China, have already identified potential issues of maintenance and of information to users and managers of such systems as vital to their success. The accuracy of their forecasts is borne out by lessons from Brazil and South Africa, amongst others. Surveys of systems installed in Brazil since the 1990s have shown that large percentages of them were inoperative, largely due to lack of maintenance. Similar results were found in Zimbabwe. In South Africa, inflated claims by system installers anxious to increase their sales commissions have led to dissatisfaction amongst users as to actual system performance. In addition, users found themselves paying more than those connected to the grid for a lower level of service. So severe were the problems in South Africa and Zimbabwe, that the case studies refer to these solutions in their present form as “froth”. The Brazilian report stresses the need for coordination of on-grid and off-grid solutions if the possible synergies between them are to be achieved.

In contrast to these examples, 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. 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 poorer people from the adverse effects of market-led reforms and have widened their access to electricity.

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 poor are to be included in the process of sustainable development, their needs must be taken into account when designing reforms, and this must be backed by political commitment.

Key Findings from all of the case studies

The following elements have been identified as forming a necessary part of reform if access to electricity services by the poor is to be improved:

- A political commitment to improve access to electricity by poor households.
- Ring-fencing of finances for electrification of poor areas.
- Explicit focus on poor households.
- Focus on the sequencing of reforms.
- Consultations with poor households on the electrification process.

APPENDIX 1 – THE CENTRES OF EXCELLENCE

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.

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.

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.

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.

EDRC

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

ENDA-TM

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

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.

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.

APPENDIX 2—REFORM TERMINOLOGY

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

- Vertical Unbundling
- Horizontal Unbundling.

1.0 Vertical Unbundling

Vertical unbundling is the process of separating vertically integrated utilities into independent generation, transmission and distribution companies. It often comprises the following steps:

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 previously unbundled generation component, the distribution entity is separated from transmission.

Complete vertical unbundling: There are three entities, i.e. generation, transmission and distribution which are independent companies.

2.0 Horizontal Unbundling

Horizontal unbundling refers to the process whereby generation or distribution, undertaken by a single monopoly utility are separated and then performed by more than one entity.

National utility: The power utility undertakes electricity generation, transmission and distribution nationwide.

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): Each province owns a utility that undertakes electricity generation, transmission and distribution.

3.0 Privatisation/Ownership Changes

Complete government ownership: 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.

Commercialisation: The utility operates on a commercial basis, ceasing to be a welfare-oriented organisation. 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, 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.

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

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

Complete private ownership: All generation, transmission and distribution entities in the country are wholly in the hands of the private sector.



GNESD

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Facilitated by UNEP

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