ENERGY Working Notes

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Energy and Poverty: Myths, Links, and Policy Issues

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SUMMARY

Bringing modern energy services to the poor is an enormous challenge. Today 1.6 billion people lack access to electricity, and 2.4 billion rely on traditional biomass fuels for cooking and heating. By 2030, if present trends continue, 1.4 billion people will still lack access to electricity—only 200 million fewer than today. And more than 2.6 billion will still rely on traditional biomass fuels—an even larger number than today.

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Energy's strong links with poverty

Contrary to myth, poor people pay a high price - in cash or in labor - for the energy they use. Moreover, they spend a much greater share of their household income on energy than do wealthy people - not only because their incomes are so much smaller but also because the fuels they use are so much less efficient than modern fuels.

In modern times no country has managed to substantially reduce poverty without greatly increasing the use of energy. Modern energy has the biggest effect on poverty by boosting poor people's productivity and thus their income. It also reduces poverty in other ways. By powering lights and modern equipment, electricity helps improve health care and education for poor people and makes it more likely that women will read and children will attend school regardless of their income level. Modern energy also lightens women's work and reduces the environmental damage from the use of traditional fuels, which has such far-reaching effects on poor people's health and livelihoods.

These strong links with poverty reduction - through income, health, education, gender, and the environment - suggest that the energy sector needs to work with other sectors to ensure that the poor benefit as much as possible from greater access to energy.

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Where are the gaps in access?

In the past 25 years the world has extended access to electricity and modern fuels to more than 1 billion people. Even so, large gaps in access remain. Four out of five people without access to electricity live in rural areas of the developing world, mainly in South Asia and Sub-Saharan Africa.

Today most of the people without access live in rural areas. But over the next three decades, when almost 95 percent of the population growth is expected to occur in urban areas, widening gaps in access may emerge in the developing world's cities. Substantially reducing the number of people without access to electricity will therefore also require targeting efforts to urban areas.

Tough public policy choices

In most developing countries, efforts to develop innovative ways to deliver modern energy services to the poor confront formidable institutional and regulatory barriers. These barriers affects rural and urban areas alike. Other barriers, and therefore policy solutions, differ sharply between rural and urban areas.

In rural areas, remoteness and low density demand raise the costs of electrification to nearly prohibitive levels. The main policy solutions are subsidizing capital costs for rural grid electrification or developing off-grid solutions. Both require careful design and skillful implementation. Nevertheless, because of the costs involved, rural access to electricity in low-income countries will not increase appreciably in the foreseeable future.

To meet their cooking needs, the rural poor will continue to rely on biomass fuel. So increasing the efficiency of biomass fuel use as well as promoting modern cooking fuels such as LPG, should be priorities.

In urban areas extending electricity access to the poor is a matter first and foremost of getting the policies right. The infrastructure is generally already in place, so energy companies need to make relatively little new capital investment. Extending the grid to a new peri-urban area occupied by the poor does require some capital expenditure, but much less relative to extending supply to new rural areas. But even with the lower capital costs and higher incomes in urban areas, poor people still often cannot afford the connection fees or monthly rates. What is needed are supportive regulatory policies that make service expansion to the urban poor sustainable.

The situation in the energy sector calls for tough public policy choices and sustained commitment. And the energy business is such that these choices require a delicate balancing act: provide enough subsidies and financing to make modern energy accessible to the poor, yet avoid distorting energy markets by favoring one fuel over another or stifling the markets through counterproductive pricing and subsidy policies.

Public policies ostensibly aimed at helping the poor often end up doing the opposite. Selling fuels at subsidized prices does poor people little good if they cannot obtain the ration cards required. Even taxing the fuels used by the well-off hurts the poor, by causing the price of fuels they use to rise. To be sustainable, programs to increase access to efficient fuels need to harness private entrepreneurship. For example, when improved stove programs simply gave away the cook-stoves, they faltered. But when the programs involved local private manufacturers and dealers, they became sustainable.

How best to design and implement policies for expanding access to energy is a question requiring close attention to the lessons from experience. They show the importance of removing institutional and regulatory barriers, designing subsidies carefully, ensuring local involvement in the design and delivery

of energy services, and protecting the poor during reforms. Policies like these, while not enough to end energy deprivation, are certainly necessary for doing so, and furthermore they can also improve the performance of the energy sector as a whole.

The Role of the Word Bank

The World Bank supports research to better understand the causes of low quality and lack of energy services and how to design better policies that can remedy these. It finances projects aimed at providing increased access and improved services and it engages in partnerships with other organizations and with government and the private sector to address these challenges.

INTRODUCTION

For the poor, the priority is the satisfaction of such basic human needs as jobs, food, health services, education, housing, clean water and sanitation. Energy plays an important role in ensuring delivery of these services.

—World Energy Council and FAO (1999, p. 21)

Today 1.6 billion people in developing countries lack access to electricity, and 2.4 billion still rely on traditional biomass fuels. This deprivation in energy has enormous impacts on the lives of poor people. Strong links between the energy sector and poverty reduction—through income, health, education, gender, and the environment—underscore the importance of the energy sector in social and economic development. They also underscore why it is important that policy makers and developers in the energy sector must work closely with colleagues in other sectors in tackling energy deprivation.

Ending energy deprivation will not be easy. It calls for tough public policy choices and sustained commitment. The energy business is such that these choices require that policy makers strike the right balance: for example in providing enough public subsidies and financing to make modern energy accessible to the poor, yet avoiding distorting energy markets by favoring one fuel over another or stifling markets through counterproductive pricing and subsidy policies.

How best to design and implement policies for expanding access to energy? Experience already points to some good lessons. It shows the importance of removing institutional and regulatory barriers, designing subsidies carefully, ensuring local involvement in the design and delivery of energy services, and protecting the poor during reforms. These policies are not enough to end energy deprivation, but they are certainly necessary for doing so.

Moreover, no one way of applying these policies will work under all the widely varying social and economic conditions around the world. Recognizing this, the World Bank undertakes research in this area. Where it sees appropriate opportunities, it remains open to providing investment and development policy lending. It also forges alliances and partnerships with organizations, governments and public and private stakeholders to help provide modern energy to the poor.

CONTEXT: MYTHS ABOUT ENERGY AND POVERTY

Myths about energy and poverty abound. Among the more pervasive is this: For poor people who use biomass energy, that energy is free and so

they are insensitive to changes in energy prices. Another myth is this: When the poor must pay for their energy, that energy is cheap compared with the modern energy used by wealthier households. And yet another: When modern energy is first introduced in an area, its cheap and easy availability will prove to be a panacea, kick-starting enormous socioeconomic development.

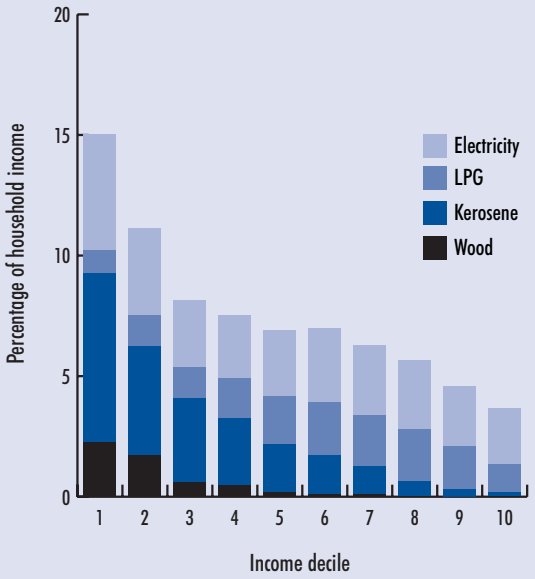
Neither free nor cheap

In rural areas where wood is scarce, poor people may pay for fuelwood or shift to less efficient energy sources such as crop residues or dung. It is not unusual for a rural household in a developing country to spend an hour or more a day collecting wood or other fuels.[1] That often means forgoing other productive activities. So the traditional fuels used by poor people are not free; to the contrary, they come at a high cost in cash or in labor.

Moreover, poor households spend a much greater share of their income on energy than do wealthy households. The cash income of the poor is so small that the meager amounts of energy they use account for an important part of their cash expenditures. In the Indian city of Hyderabad, for example, poor households spend 10–15 percent of their income on energy, while wealthy households spend less than 5 percent (figure 1). Poor people in rural areas spend a smaller share of their income on energy, but it is still significant. In rural India poor households spend as much as 8 percent of their very small incomes on energy, most of it on kerosene for lighting (figure 2).

Energy services also cost the poor more because using such fuels as wood and kerosene for cooking and lighting is less efficient than using modern fuels. Adding to their cost, the poor often must buy fuelwood and charcoal in small amounts. When comparative efficiencies and transaction costs are taken into account, the delivered energy for cooking often ends up being more expensive for poor people than for the better-off.

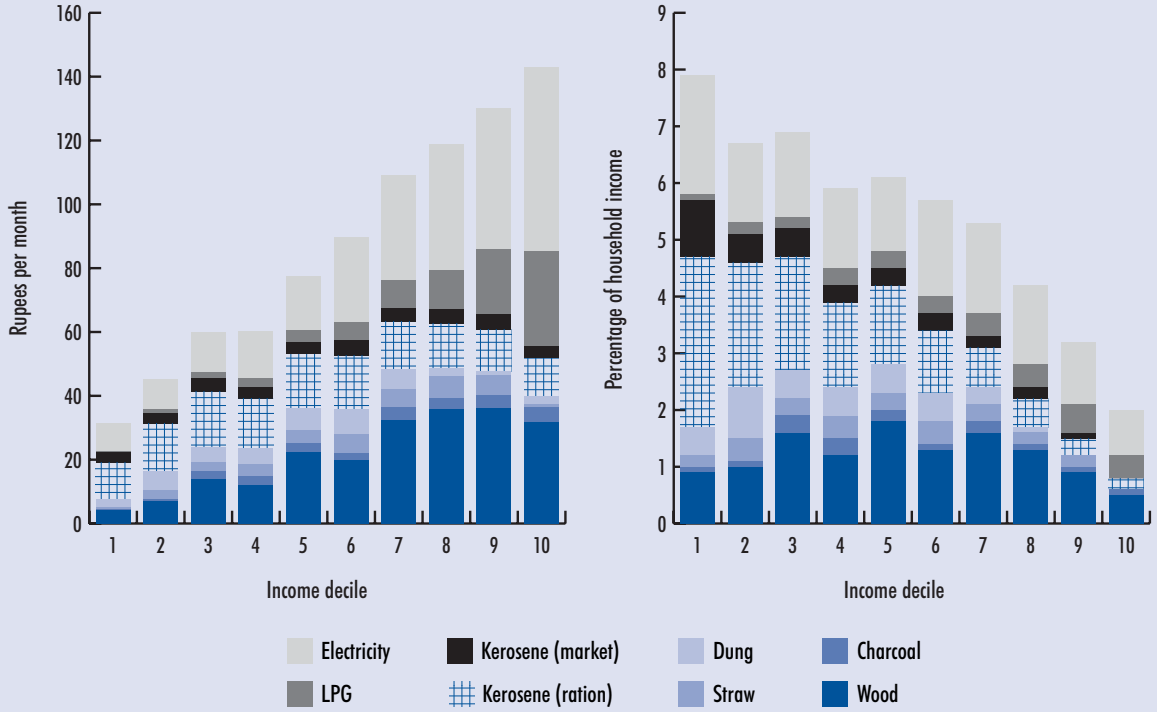
Figure 1: Household energy expenditures by income level, Hyderabad, 1994



Source: ESMAP 1999.

[1] A study in the hill areas of Nepal showed that even in areas with fairly good supplies of wood, women needed to spend more than an hour a day collecting fuels. In areas where wood was more scarce, the chore lasted about two and a half hours a day (World Bank 1996).

Figure 2: Household energy expenditures by income class, rural India, 1996



Source: ESMAP 2000.

Necessary but not sufficient for development

Economies that have replaced human and animal labor with more convenient and efficient sources of energy and technology have grown faster. Indeed, in modern times no country has managed to substantially reduce poverty without greatly increasing the use of energy. Without ensuring minimum access to energy services for a broad segment of the population, countries have not been able to move beyond a subsistence economy. But merely introducing cheap, easily available modern energy is not enough to ensure socioeconomic progress. Other factors are also crucial.

Energy services are consumed in the process of providing other goods and services, thus the demand for energy is derived from the demand for other goods and services. For example, in a rapidly developing agricultural region, the introduction of electricity will help raise the productivity of local agro-industrial and commercial activities by supplying motive power, refrigeration, lighting, and process heating. Higher productivity, in turn, will lead to higher earnings, which will create greater household demand for electricity. But when development efforts fail because of poor crop pricing and marketing policies, improving electricity supplies alone will have little effect on local welfare.

Thus when policymakers assess the prospects for policies focused on improving energy supplies, they also need to consider sources of energy demand such as local health and education programs, macroeconomic and pricing policies, and complementary infrastructure such as roads, water supplies, and sanitation.

ENERGY'S LINKS WITH POVERTY REDUCTION

Clearly energy for the sake of energy is not useful. Its utility lies in facilitating human development. The energy sector has strong links with poverty reduction through income, health, education, gender, and the environment. These links suggest that the energy sector needs to focus increasingly on working with other sectors to ensure that the poor benefit as much as possible from greater access to energy supplies.

Increasing income

Perhaps the most important way the energy sector can improve the lives of poor people around the world is by helping to increase their meager income. To begin with, modern energy can greatly increase their productivity. Petroleum fuels power motorized transport that speeds the movement of goods between outlying areas and markets—and power agricultural activities that help expand crop production. Electricity enables poor households to engage in activities that generate income—by providing lighting that extends the workday and powering machines that increase output and it raises the productivity of small businesses and shops and powers telecommunications.

All this is reflected in the strong correlation between energy consumption and national income. Most economic activity would be impossible without energy, even the small and medium-scale enterprises that are the main source of jobs for the poor. The kind of economic growth that creates jobs and raises incomes depends on greater and more efficient use of energy.

Contributing to better health

Modern energy helps improve health in many ways. By powering equipment for pumping and treating raw water, it helps ensure a clean water supply, reducing the incidence of waterborne diseases, especially in slums. By boosting agricultural production and household incomes, it helps reduce the malnutrition that is such a big factor in child mortality. And by allowing households to switch to kerosene or liquefied petroleum gas (LPG), it enables the poor to avoid cooking with biomass fuels like wood and dung, whose emissions cause respiratory ailments that are the fourth leading health risk in developing countries (WHO 2002, p. 69).[2]

Modern energy also helps improve health indirectly. Electricity enables health clinics to refrigerate vaccines, operate medical equipment, and provide

[2] Studies of women that were non-smokers, in India and Nepal who were exposed to smoke from fires using biomass fuel, found that their death rate from chronic respiratory disease was similar to that of male heavy smokers (World Bank 1996, p. 2). The World Health Organization estimates that 20 percent of the 10.9 million deaths of children under five in 1999 were due to acute respiratory infections (Bruce, Perez-Padilla, and Albalak 2000). Although the extent to which cooking smoke contributes to acute respiratory infections is not yet clear, it is generally accepted that there is a link between indoor air pollution and such infections in children.

treatment after sunset. It allows the use of modern tools of mass communication needed to fight the spread of HIV/AIDS and other preventable diseases. And through its benefits for education, it leads to higher literacy among women, which translates into better health for children.

Supporting education

For poor people everywhere, access to modern energy services frees time for education—time that would otherwise be spent collecting traditional fuels or in other menial work. It also frees children to attend school, by boosting productivity and thus allowing adult labor to substitute for child labor. For both adults and children, electric lighting in homes enables them to study after their daytime activities. And in rural areas, modern energy helps retain teachers by improving their quality of life.

A survey in Nicaragua illustrates the relationship between education and household electricity use (Table 1). It was found that the percentage of a family's children that attend school is highly correlated with the availability of electricity. Among rural households in Nicaragua, 72 percent of children living in a household with electricity attend school, compared to 50 percent of those living in a household without electricity.

Improving women's quality of life

Increasing access to energy brings disproportionate benefits for women - in health, education, and productive activities - since in many parts of the world it is they who spend more time than men cooking and collecting water and fuel. Modern cooking fuels free women from the burden of collecting and carrying large loads of fuel-wood and from exposure to smoke from primitive cooking stoves. And modern energy for lighting and motive power enables women to develop cottage industries that can increase their incomes.

A survey of women's time use in rural India shows how access to electricity can benefit women. The probability that a woman will read is strongly related to whether the home has electricity. Indeed, regardless of income level, virtually no reading takes place in households without electricity. About 11 percent of the sample reported spending some time reading on the day of the survey - and these women reported doing so for about an hour a day on average. Averaging this

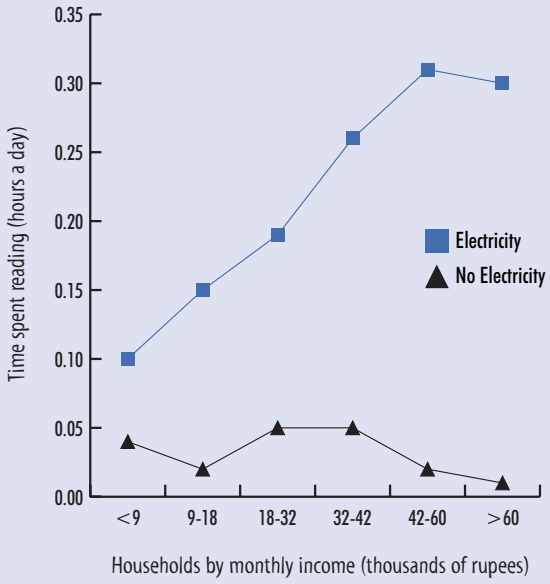
Table 1. Nicaragua 1998

REGION	PERCENTAGE OF CHILDREN ENROLLED IN SCHOOL		NUMBER OF HOUSEHOLD MEMBERS WHO ARE LITERATE		PERCENTAGE LITERACY IN HOUSEHOLD	
	WITH ELECTRICITY	NO ELECTRICITY	WITH ELECTRICITY	NO ELECTRICITY	WITH ELECTRICITY	NO ELECTRICITY
Atlantic	77	40	3.02	2.23	74	46
Central	77	46	3.02	2.27	74	50
Pacific	73	62	3.79	3.1	77	62
Total	72	50	3.37	2.51	73	53

Source: World Bank, 2002; Barnes and Kulkani, 2005.

time across all the households shows that higher-income women spend more time reading than lower-income women. But among lower-income women, those in households with electricity have a much greater likelihood of reading than those in households without electricity. Moreover, lower-income women have a lower literacy rate than higher-income women and so would have a lower possibility of reading. Thus the high-quality lighting made possible by electricity appears to make it more likely that women will read in the evening regardless of their income level (figure 3).

Figure 3: Household income, Electricity, and time spent reading by women, rural India, 1996



Source: Energy Sector Management Assistance Programme (ESMAP), Energy Survey 1996.

Reducing environmental harm

Poor people are both the agents and the victims of environmental damage. Fuel-wood gathering can lead to land degradation, biomass combustion to indoor air pollution, dirty fuels to outdoor air pollution and, through greenhouse gas emissions, global warming. In all these cases poor people both contribute to the environmental damage through their actions and suffer from its consequences. And in all these cases the energy sector has a significant part to play in reducing the environmental damage and its harmful effects—by introducing renewable energy sources, supplying modern cooking fuels, substituting cleaner fuels for dirty ones, and increasing energy efficiency.

STATUS: BIG GAPS REMAIN IN ACCESS TO MODERN ENERGY

Both the costs associated with using traditional fuels and the benefits of introducing modern energy services underscore the importance of ensuring that people have access to modern energy. How much progress has the world made in extending access to energy services?

Advances over the past 25 years have been remarkable, with more than 1 billion people in developing countries gaining access to electricity and modern fuels. But as impressive as this accomplishment is, large gaps in access remain. While (mostly urban) higher-income households now have access to modern energy, the world's poorest (mostly rural) households do not. Some regions lag further behind than others. While problems of access are now far greater in rural than in urban areas, the rapid growth expected in urban populations in the next decades could lead to growing gaps in access to electricity in cities.

Rural areas are far behind urban areas in access to electricity

According to the International Energy Agency, 1.6 billion people—around a quarter of the world's population—lack access to electricity. Moreover, under today's energy policies and investment trends in energy infrastructure, projections show that as many as 1.4 billion people will still lack access to electricity in 2030.

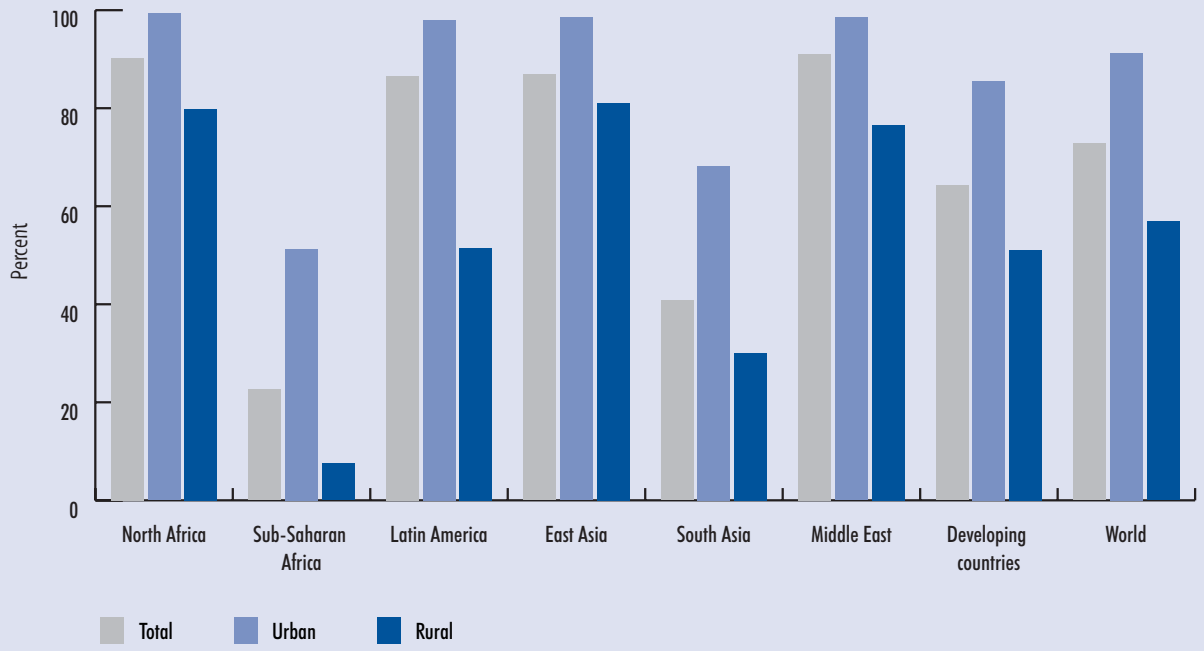
In Sub-Saharan Africa only 8 percent of the rural population has access to electricity, compared with 51 percent of the urban population (figure 4). A similar disparity exists in South Asia, where only 30 percent of the rural population has access, compared with 68 percent of the urban population. Indeed, four out of five people without access to electricity live in rural areas of the developing world, mainly in South Asia and Sub-Saharan Africa.

Continuing reliance on traditional fuels

Large gaps also remain in access to modern fuels such as kerosene and LPG. Nearly 2.4 billion people in developing countries still rely on wood, agricultural residues, and dung for cooking and heating (table 2). And projections show that without greater efforts to address this problem, the number will grow to 2.6 billion by 2030.

All these people must contend with the burdensome disadvantages of using traditional fuels. As noted, cooking with fuels such as biomass is far less efficient

Figure 4: Share of population with access to electricity by region, 2000



Source: International Energy Agency 2002.

than cooking with modern fuels such as kerosene or LPG. Women and children must spend hours gathering biomass fuels. And biofuels burned in poorly ventilated homes and inefficient stoves cause harmful indoor pollution, with serious consequences for human health.

Table 2. People relying on biomass for cooking and heating in developing countries, 2000

COUNTRY OR REGION	MILLIONS	PERCENTAGE OF POPULATION
China	706	56
Indonesia	155	74
Rest of East Asia	137	37
India	585	58
Rest of South Asia	128	41
Latin America	96	23
Middle East and North Africa	8	1
Sub-Saharan Africa	575	89
All developing countries	**2,390**	**52**

Source: International Energy Agency 2002.

Urban access to electricity

Almost 91 percent of the world's urban population has access to electricity. Indeed, in some parts of the world almost the entire urban population has access: in North Africa, East Asia (including China), the Middle East, and Latin America the share is at least 98 percent (International Energy Agency 2002). So the problem of providing access to electricity is primarily a rural one.

Access to electricity will remain scarce in rural areas. But it is expected to become more difficult in urban areas too. Over the next three decades almost 95 percent of the growth in population is expected to occur in urban areas. Fast population growth, rapid urbanization, and rising demand for electricity will exert tremendous pressure on infrastructure, creating strong demand for new investment. In the Middle East and North Africa, for example, the World Bank expects demand for electricity to grow by an average 6 percent a year to 2010 (World Bank, Middle East and North Africa Region 2004). Unless appropriate steps are taken to meet that growing demand, the urban poor will surely lose ground in access to electricity.

ENERGY POLICIES FOR POVERTY REDUCTION

Projections for the next three decades show that the problems of access to modern energy will not vanish—and indeed may grow—if steps are not taken soon to address key issues in the energy sector. In most developing countries efforts to develop innovative ways to deliver modern energy services to the poor face formidable institutional and regulatory barriers, and conventional energy strategies generally allow poor people little say. Tax and other policies can make it difficult for poor people to move up the energy ladder to cleaner, more efficient fuels. And energy reforms designed and implemented without local involvement can end up hurting rather than benefiting the poor. More often than not, it is one or more of these issues that pose the biggest obstacles to extending access to modern energy services to the poor.

The energy policies that have proved to be effective in addressing these issues can improve the performance of the energy sector as a whole, benefiting both rich and poor and both rural and

urban consumers. But for some energy issues the best policy choices for the urban poor may differ from those for the rural poor. Moreover, the magnitude of the change that public policy must bring about differs substantially between rural and urban areas.

Rural areas often lack any infrastructure for providing energy services. So here, energy policy must conceive the entire energy infrastructure network, develop new energy businesses, and ensure that the business model is economically sustainable and financially replicable.

By contrast, most urban areas have energy providers that already serve better-off populations. Thus, the main energy policy issue in urban areas is to support or improve the energy infrastructure and provide adequate regulatory guidance so as to ensure that energy providers extend services to the urban poor.

Breaking down institutional and regulatory barriers

Other policy issues are common to both rural and urban settings. Poor institutional and regulatory frameworks can create serious obstacles to the delivery of modern energy services. Policies may impede the flow of private finance to the energy sector and discourage innovation in service delivery methods. In many countries, for example, it is not permitted for local private or cooperative generation and distribution enterprises to enter the market. Regulatory frameworks often raise the largest barriers to decentralized options for energy supply, including alternative energy technologies for locations not served by electricity and fuel distribution networks. Poorly formulated taxes and subsidies often undermine energy service markets by favoring one fuel over another, sending consumers the wrong signals, and creating disincentives for entrepreneurial solutions to energy supply. Another problem is the use of top-down approaches that allow users, particularly the poor, little say in how energy services are designed and delivered.

What does experience show about how best to tackle these issues? Sound sector policies provide the basis for improving access to energy for rural and urban populations. Energy sector reform should include opening up energy markets. Macroeconomic policies should avoid discriminating against or favoring particular energy technologies. Price-distorting subsidies and taxes should be eliminated—though a need remains for well-thought-out, intelligently implemented subsidies that genuinely benefit the poor and yet avoid creating disincentives for energy companies. The use of direct cash support to mitigate the impact on the poor of subsidy phase out allows the commercialization of utilities, through the elimination of cross subsidies. This approach requires a solid institutional infrastructure for delivery of a well targeted subsidy mechanism.

Regulatory policies should allow rival technologies to be selected on the basis of their economic merits and regulatory or market barriers should not discriminate against any technologies. Also essential is to ensure the participation of local communities, investors, and consumers in the design and delivery of energy services. Decentralized approaches, including systematic local capacity building, need to be part of the solution.

All these measures will work to ensure a better choice of affordable energy for both rural and urban consumers, so that informed consumers can choose the most cost-effective solution based on their own preferences.

Extending access to the rural poor—an expensive proposition

Once a sound institutional and regulatory framework is in place, the most important energy issue is probably cost. Energy is an expensive business. Installing a microgrid in a community can cost tens of thousands of dollars.

The costs become almost prohibitive in rural areas, where the remote locations and low density demand raise the costs and reduce the profitability of supplying energy. The training, technical assistance and capacity building that are needed to support rural electrification schemes add to the costs. All these costs mean that energy companies would have to charge high connection fees and monthly rates to recover their investments—fees that the poor cannot afford to pay.

But technological and commercial innovations can lower the costs of producing energy and financing and managing services. And better credit mechanisms, lower-cost equipment, and appropriate service standards can reduce the initial cost of obtaining energy.

Subsidizing capital costs for rural grid electrification

High capital costs are the chief disincentive to supplying grid electricity to rural areas, so where grid electrification is the chosen option, this issue needs to be tackled first. One solution is subsidies. Subsidies involve some serious drawbacks but they can enable the rural poor to gain access to modern energy. The challenge is to design better subsidies and efficient ways to provide them.

Subsidy design is an area where more work is needed. Even so, it is becoming increasingly clear that operating costs should not be subsidized as a way to promote rural grid electrification. Experience around the world suggests that subsidies for capital costs are more sustainable and beneficial than those for operating costs. Output-based aid (OBA) is an approach being used to promote the effective use of public funds for the delivery of infrastructure services. Under this approach, governments delegate service delivery to a third-party under contracts that tie disbursement of public funding to the services or outputs actually delivered to targeted groups. Governments use such performance-based subsidies where policy concerns, such as the affordability for particular groups of users, justify public funding to complement or replace user fees. Recent examples of World Bank supported output-based aid projects include an electricity access project in Mozambique.

A good rule of thumb is to make grant subsidies available to energy service companies for investments in infrastructure access and, as necessary, some form of cross-subsidy from better-off energy users to lower the costs of the most vulnerable populations.

To avoid unproductive capital expenditure, care must be taken to ensure that the capital cost subsidies are not too high when the service rates are likely to be too low. In situations such as these, energy companies have been known to make capital investments and extend the grid but fail to supply power through the extensions.

From the regulatory point of view, the need to explicitly differentiate tariffs according to the quality of power supply is important. Although the cost of

supply to rural areas is higher, most often the quality and availability of electricity is very poor and cannot justify a high price; more importantly, the lack of differentiation between quality and tariffs is an obstacle to the private provision of services.

Developing off-grid solutions

Most rural electrification programs have focused on connecting rural areas to national or local grids. But grid-supplied electricity is not always the least-cost option, and planners need to consider other possibilities.

In remote or inaccessible areas where grid supplies are impractical for cost, technical, or institutional reasons, people generally meet their need for power and lighting through LPG, kerosene, dry cell and car batteries, and, occasionally, small diesel or gasoline generators. In addition, photovoltaic systems are proving to be increasingly competitive on cost and service quality criteria with these conventional energy sources.

Promising new approaches to providing electricity services to new rural customers far from the grid are beginning to emerge (box 1). Among recent off-grid electricity programs, most of the successful ones have involved a fund for providing loans and subsidies to rural communities, private entrepreneurs, or nongovernmental organizations that develop a viable business plan for providing rural electricity service. After the initial subsidies for establishing the electricity service, the business must demonstrate that it can maintain financial viability while continuing to serve the rural population.

Extending access to the urban poor—mostly a policy issue

In sharp contrast to poor rural residents the urban poor live next door to modern energy services. Thus energy companies need to make little or no new capital investment to extend access to them. Expanding access to the urban poor is thus more a matter of regulatory policy than of cost. Extending the grid to periurban areas occupied by the poor does require some capital expenditure, but much less than extending supply to new rural areas.

Sometimes energy companies neglect the urban poor simply because they do not give them priority. At the same time there are genuine business obstacles to serving the poor, such as low energy purchases and unpaid bills. Regulators and urban energy companies working in close cooperation and formulating supportive regulatory policy may make it easier for the companies to serve the urban poor. For example, regulators could allow energy companies serving urban markets to charge different rates, using subsidized rates for poor customers and charging higher rates for affluent, high-volume customers to make up the lost revenue.

Public-private partnerships can strengthen the institutional and financing arrangement for expanding access. For example, the Agreement of Guidelines (Acuerdo Marco) in Argentina has been effective in blending the efforts of the energy companies and the national and provincial governments, overlapping with other social assistance plans (Chisari, Estache & Waddams Price, 2001).

Financing the up-front costs of connections

Both the urban and rural poor are often deprived of access to modern energy services because they

Box 1. Approaches to providing off-grid electricity

The **dealer model** centers on developing dealers that can sell equipment (usually for photovoltaic systems) to people living in rural areas far from the grid. Developing countries usually have existing retailers that serve rural areas, but they are typically weak and undercapitalized and serve limited territories. Programs based on this model have tried various ways to strengthen dealer networks, with mixed results. In Indonesia such a program failed in part because it was implemented just before the financial crisis. But it had become evident that participating retailers preferred to sell photovoltaic systems for cash rather than providing them on a lend-lease basis. In Sri Lanka a project started out successfully, but multinational companies soon took over the local retailers that the project was assisting.

The **concession model** is aimed at minimizing subsidies and encouraging private sector participation. The model depends on regulation by contract more than by market forces, but it helps to ensure that projects achieve large-scale economies. In Argentina, for example, a World Bank–financed project is using competitive bidding to award franchise rights for rural service territories to the concessionaires offering to provide service for the lowest subsidy. Concessionaires can choose from a range of off-grid technologies, though photovoltaic systems are expected to be the most cost-effective choice in many cases. Users pay a connection fee and monthly service tariff (set by the government), and the government pays the concessionaires a declining subsidy determined by their contract.

The **retailer model** involves a decentralized approach to providing electricity to households without access to grid service. A community, organization, or entrepreneur develops a business plan for meeting local demand for electricity, then submits the plan to a project committee (see EAA, RAEL, and ERG 1999). If the committee approves the plan, it grants a loan or subsidy (depending on the situation) for developing the business. The retailer uses a fee-for-service arrangement to recover costs, repay the loan, and earn a profit. This approach ensures significant local involvement and consumer choice. In this model, as in others being pursued, two key aims are to control transaction costs and realize scale economies.

cannot afford the up-front costs of aquiring service and because they cannot afford the per-unit rates that are charged once they have a connection. Moreover, in some cases they are also charged disconnection and reconnection fees.

Clearly, financing mechanisms are needed to bring the up-front costs within reach of the poor, as well as well-targeted, well-planned subsidies to make monthly energy consumption affordable. In addition, energy companies should be discouraged from charging high disconnection and reconnection fees.

Identifying sound credit and financing mechanisms is difficult and designing well-targeted subsidies is even more so.

While up-front costs pose large burdens for poor people in rural and urban areas alike, the high capital costs of providing rural energy service mean that the rural poor face even greater difficulties in paying the initial costs. The fee for connecting to grid electricity in developing countries ranges from $20 to $1,000. And a solar home system costs from $500 to $1,000, depending on the system. Such costs are prohibitive for rural consumers with relatively low incomes and little access to long- or even short-term credit.

There are two ways of dealing with these high initial costs of rural energy service. The first is to lower system costs through design innovations. Power demand in rural areas of developing countries typically ranges from 200 to 500 watts. But many distribution companies design systems capable of delivering 1000 to 3000 watts—which means

heavier wires, larger transformers, and generally more expensive distribution system components. The entire system can be lightened to supply the actual level of demand at less cost. Similarly, while many development agencies promote a standard household photovoltaic system of 50 watts, experience from China and Kenya suggests that many people start off by purchasing more affordable photovoltaic systems of 12 to 20 watts (EAA, RAEL, and ERG, 1999).

The second way to lower initial costs is to spread them over time by ensuring access to credit for both consumers and suppliers of energy services. In many developing countries moneylenders charge consumers rates of more than 100 percent per year putting any energy system out of reach for the rural poor. Electricity companies can provide credit by spreading payments over several years and including the charge on regular electricity bills. Some NGOs make credit available for the installation of microgrid systems based on renewable energy technologies. These and many more credit options can ease the financing of initial service costs for rural consumers.

The rural poor may also have difficulty paying for energy services because their income is seasonal. Dependent primarily on an agrarian economy, they can find themselves strapped for money during the off-season. Energy companies serving such customers should be encouraged to allow them a more flexible payment schedule.

Introducing improved stoves for better health and greater fuel efficiency

More than half the population in developing countries still rely on traditional biomass fuels for cooking and heating—and thus are subject to all the health risks posed by biomass combustion. One way to reduce indoor air pollution and its harmful health effects is to provide improved stoves that are more efficient, emit less smoke, and vent smoke outside the home.

In the late 1970s to early 1980s developing country governments, donors and NGOs supported improved stove programs. The most successful programs in that period followed several principles. They included focusing efforts on regions where there were biomass fuel shortages or where such fuels were commercially available; providing subsidies for supporting services rather than for the stoves themselves; ensuring significant interaction between stove designers and users; relying on mass-produced stove components to reduce costs; and basing programs on a long-term government commitment rather than on short-term international donor interests.

Increasing evidence that indoor air pollution has caused large increases in illness and even death in both rural and urban areas has lent greater urgency to the task of developing effective programs for disseminating improved stoves. Initially most such programs were aimed at improving energy efficiency and thus conserving scarce fuel-wood resources. Relatively simple, inexpensive stoves can reduce the fuel needed for cooking by as much as 30 percent. In cities where people rely heavily on wood and charcoal and energy prices are relatively high, fuel-efficient stoves can reduce the aggregate demand for wood, easing pressure on the surrounding land and conserving poor households' scarce cash income. In rural areas more efficient stoves can release some of the time spent gathering fuel-wood for productive and domestic activities (Barnes, Krutilla & Hyde 2005).

But improved stove programs have not always been successful in developing countries. Program failures in the 1970s and early 1980s taught important lessons. One is that governments should promote private sector initiatives to develop and market improved stoves in rural areas. Another is that programs must be carefully targeted to those who will benefit the most. The Chinese National Improved Stove Program, the largest ever undertaken (disseminating 120 million stoves to rural households) succeeded in part because it focused on areas with the greatest fuel-wood shortages (Smith et al 1993).

Removing obstacles to interfuel substitution

Urban households, as their incomes grow, tend to substitute more efficient modern fuels (such as LPG) for traditional fuels (such as wood). Apart from efficiency, this interfuel substitution can have important welfare benefits too. For example, it can help reduce indoor air pollution and alleviate pressure on wood resources around urban areas. To encourage interfuel substitution, it is important not to impose taxes on modern fuels or to hinder their distribution. A tax on modern fuels encourages many middle-income people to continue to rely on wood beyond the point at which they would normally have switched fuels. This increases the demand for wood and thus its price. Because the prices of modern fuels set a "cap" on the prices of traditional fuels used by poor people, taxes on modern fuels can inadvertently hurt the poor (box 2).

Restrictions or bottlenecks on the import and distribution of transition fuels such as coal and kerosene also should be eliminated, because they make it difficult for the poor to substitute these more efficient fuels for traditional fuels. For example, India used to ration kerosene at subsidized prices but in practice poor people found it difficult to obtain ration cards. Various schemes of this type for targeting subsidies have been tried in many countries but there is little evidence that they have worked well and, once established, are very difficult to reform. Another way to help the poor use more efficient fuels may be to provide them credit for purchasing appliances such as stoves. This strategy may prove more effective and sustainable than subsidizing the fuel itself, because it avoids distorting the market. However the lessons of the Deepam scheme in Andra Pradesh in India are cautionary in this regard. While the high up-front cost of LPG cylinders was a significant barrier to LPG use, a government program to subsidize LPG cylinder purchase did not bring about the anticipated increase in LPG consumption by poor households.

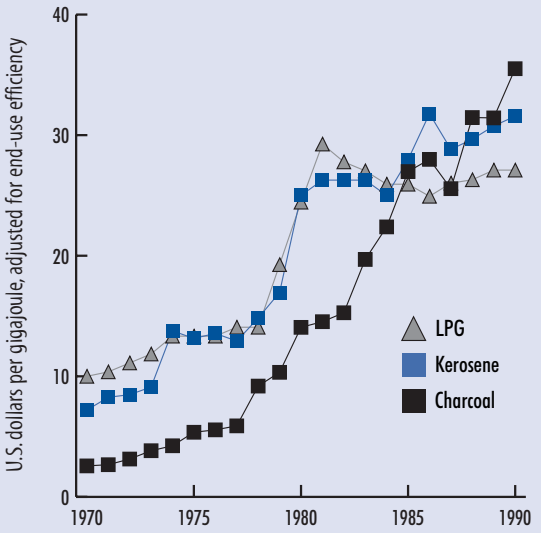
Box 2. Taxing fuels used by the rich inadvertently hurts the poor

LPG and kerosene prices in Haiti have historically been among the highest in the Caribbean. These high prices meant that only a small fraction of the population could afford these fuels, forcing the poor to depend on charcoal for cooking.

LPG and kerosene prices have historically been related to the price of charcoal. As wood resources disappeared from rural markets as a result of deforestation, the price of charcoal approached that of alternative commercial fuels, and by 1990 there was almost no price difference. Because of the strong demand for charcoal, its price rose until it reached the price of alternative cooking fuels, including LPG and kerosene. But it did not exceed the price of those fuels because, if it had, people would have switched from charcoal to LPG or kerosene. As a result of this relationship, taxes on LPG and kerosene meant higher prices for charcoal. If liquid fuels had been taxed lightly rather than heavily and priced to reflect their economic cost, consumers would also have paid less for charcoal.

The low incomes of the poorest groups severely constrained their ability to purchase LPG refills so their consumption remained low (Rajakutty et al, 2002).

Figure 5: Energy prices in Haiti



Source: ESMAP 1991.

Protecting the poor during periods of high oil prices

A recent analysis (ESMAP, 2005) of the impact of the impact of higher oil prices on low income countries and on the poor pointed out that at the level of protection for households, where oil price rises will be felt most directly, governments must balance short term support of subsidies, whether targeted or across the board, with the longer term need to let the market work in order to force the discipline of higher prices on the choice of fuels and energy use practices. Determination of the actual severity of the impact of higher prices on the poorest groups in society will reveal whether the problem in terms of equity is so severe that a trade off against efficiency needs to be made, if only in the short run.

Poor households also feel the indirect effects of higher fuel prices through increased prices of other goods and services that are affected by higher fuel prices. A recent study of household energy use in Yemen (ESMAP, 2005) found that if the price of diesel were raised to its economic price equivalent to its import parity price (in 2004 diesel was priced at just 43% of its import parity price) the indirect impact on households would be far greater than the direct impact because poor households purchase very little diesel for direct use. The study found that raising diesel prices to import parity levels would mean that the estimated percentage changes in total household expenditure of the poorest households would be 5% through the increased cost of non-energy goods and services, and just 0.4% due to the increased cost of diesel.

The alternative to direct subsidies on fuels, where the impacts of higher oil prices on the poor are really substantial, is to consider general income subsidies such as cash transfers to poor households. To be effective such schemes must have good targeting mechanisms so that the intended beneficiaries (the poor) receive the income support and leakage to others is minimal.

Protecting the poor during reforms

Policy reforms like those discussed here can improve the energy sector's overall performance. But without enough local involvement in designing and implementing energy reforms, policy makers run the risk of failing to protect the interests of the poor. Even well-meaning energy reforms that will probably benefit the poor in the long run can cause them immense difficulties in the short run. Because energy

accounts for such a large share of cash expenditures by the poor, and their cash incomes are so small, even modest changes in energy expenditures pose a real hardship.

Similarly, the privatization of inefficient energy companies can lead to better service and lower cost of power supply by reducing system losses. However private service providers need incentives to serve poor households or otherwise the benefits of reform will accrue mainly to wealthier households that already have service. Thus it is vital to protect the interests of the poor during energy reforms. Lifeline tariffs for a small amount of monthly consumption, zonal subsidies for low income neighborhoods, service obligations in concession agreements and in the regulatory framework and the phasing in over time of higher tariffs are all policy options that can protect the poor during reform.

In Eastern Europe unlike other regions, the socialist system gave almost all households access to reliable, subsidized electricity. So the welfare gains from increased access—one of the most immediate and tangible benefits of power sector reforms—is not a consideration in those countries. In this region sector reform involving restructuring and change in ownership of electricity companies is closely linked to a fall in welfare as subsidies were reduced. Electricity spending as a share of income increased, especially for the poor, while consumption remained the same or declined. A lesson learned is the necessity of scheduling tariff increases to coincide with service quality improvements and mitigating the effect of electricity tariff increases by improving access to and efficiency in the use of clean alternatives such as natural gas (Lampietti, 2004).

Accepting the limitations of energy policies

Government interventions in the energy sector, whether in urban or in rural areas, will need to vary depending on local needs and conditions. Policy choices also must take into account the relationships among interventions. For example, it would be counterproductive to promote fuel subsidies while also expecting consumers to take measures aimed at conserving energy, such as purchasing more efficient appliances. No set of interventions can be effective in the face of other conditions that prevent them from working. In short means that a narrow focus on any one policy may do more harm than good.

THE WORLD BANK'S ROLE

The World Bank's energy practice is increasingly focusing on the important role that the energy sector can play in improving poor people's lives and in reducing poverty.

The World Bank contributes to the development of energy services for the poor through a variety of instruments.

Analytical and advisory services

The World Bank promotes and finances research into the links between energy and poverty and in assessing the benefits and limitations of energy programs in reducing poverty. Governments draw on these studies to design reform policies and investment projects that promote access to energy services.

Investment and adjustment lending

The World Bank supports investments aimed at improving access to energy services and increasing their affordability. Illustrative projects approved in 2004 include ones in Cambodia, the Philippines, and southern Africa. Descriptions of all Bank financed projects can be found on the World Bank website by searching under "Projects and Operations".

In the Cambodia project, the World Bank's investment of $40 million leverages $150 million of total investment. The project includes a rural electrification component that supports grid extension to cover low- and medium-voltage lines and electrification for rural households.

In the Philippines, the World Bank's investment of $150 million leverages $233 million of total investment. This project targets rural electrification, through investments in the existing grid supply system and support to small power generation, decentralized grids, and stand-alone systems based on renewable energy technologies. In addition, the project is aimed at reducing market barriers to the commercialization of renewable energy technologies by building capacity in relevant public and private entities.

The Bank's investment of $450 million in the Southern African Power Market Project aims to increase the availability and reliability of low-cost, environmentally friendly energy in the region by helping to prevent the development of uneconomic generation schemes and by fostering conditions attractive to private investment in generation. By ensuring that power systems are developed cooperatively rather than individually, the project could save the region more than $1 billion over 16 years.

Partnerships

Partnerships are critical to advancing knowledge about policies that work in expanding access to energy and to achieving their broader application. The World Bank often partners with the regional multilateral development banks in energy infrastructure projects, as a joint sponsor and investor.

The World Bank is also engaged in other partnerships for research and knowledge sharing, including the Global Village Energy Partnership (GVEP), the Energy Sector Management Assistance Programme (ESMAP), and the Public-Private Infrastructure Advisory Facility (PPIAF).

Launched in Johannesburg during the 2002 World Summit on Sustainable Development and promoted by the World Bank, GVEP seeks to bring partners together to meet the challenge of scaling up access to energy. The initiative will provide a central clearinghouse for information and promote the dissemination of knowledge. In addition, it will promote a network of practitioners - energy professionals, entrepreneurs, governments, consumers, and nongovernmental organizations - to develop best practices and lessons learned from projects as well as information on construction, financing, and new technologies.

ESMAP, a global technical assistance program, was established in 1983 under the joint sponsorship of the World Bank and the United Nations Development Programme. The program helps build consensus and provides policy advice on sustainable energy development to governments of developing and transition economies. It also contributes to the transfer of technology and knowledge in energy sector management and the delivery of modern energy services to the poor.

PPIAF is a multi-donor technical assistance facility aimed at helping developing countries improve the quality of their infrastructure through private sector involvement. Launched in 1999, PPIAF was developed as a joint initiative of the governments of Japan and the United Kingdom, working closely with the World Bank. PPIAF channels technical assistance to developing country governments on strategies and measures to tap the full potential of private involvement in infrastructure and identifies, disseminates, and promotes best practices on matters relating to private involvement in infrastructure in developing countries.

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Web Sites

World Bank Group
www.worldbank.org/

Energy Sector Management Assistance Programme (ESMAP)
www.esmap.org/

Global Partnership on Output-Based Aid (GPOBA)
www.gpoba.org/html/gpoba_aboutoba.asp

Public-Private Infrastructure Advisory Facility (PPIAF)
www.ppiaf.org/

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