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Rural Energy and Development Roundtable

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PURPOSE

The Joint UNDP/World Bank Energy Sector Management Assistance Programme (ESMAP) is a special global technical assistance program run by the World Bank's Industry and Energy Department. ESMAP provides advice to governments on sustainable energy development. Established with the support of UNDP and 15 bilateral official donors in 1983, it focuses on policy and institutional reforms designed to promote increased private investment in energy and supply and end-use energy efficiency; natural gas development; and renewable, rural, and household energy.

GOVERNANCE AND OPERATIONS

ESMAP is governed by a Consultative Group (ESMAP CG), composed of representatives of the UNDP and World Bank, the governments and other institutions providing financial support, and the recipients of ESMAP's assistance. The ESMAP CG is chaired by the World Bank's Vice President, Finance and Private Sector Development, and advised by a Technical Advisory Group (TAG) of independent energy experts that reviews the Programme's strategic agenda, its work program, and other issues. ESMAP is staffed by a cadre of engineers, energy planners, and economists from the Industry and Energy Department of the World Bank. The Director of this Department is also the Manager of ESMAP, responsible for administering the Programme.

FUNDING

ESMAP is a cooperative effort supported by the World Bank, UNDP and other United Nations agencies, the European Community, Organization of American States (OAS), Latin American Energy Organization (OLADE), and public and private donors from countries including Australia, Belgium, Canada, Denmark, Germany, Finland, France, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, the United Kingdom, and the United States.

FURTHER INFORMATION

An up-to-date listing of completed ESMAP projects is appended to this report. For further information or copies of completed ESMAP reports, contact:

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Rural Energy and Development Roundtable

April 16–18, 1997

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Preface

Developing countries are facing two crucial and related problems in providing access to energy to the less favored parts of their population. The first is the widespread inefficient production and use of traditional energy sources such as fuelwood and agricultural residues, which pose economic, environmental and health threats. The second is the highly uneven distribution and use of modern energy sources, such as electricity, petroleum, liquid petroleum gas (LPG) and natural gas, which raise important issues of economics, equity and quality of life. Simply expanding the supply of modern energy will not address these problems in a meaningful way. For the next 30 years, both urban and rural populations in developing countries will continue to depend to a great extent on traditional fuels. There exists a need to develop new insights, identify new approaches and methodologies and formulate realistic and comprehensive policies and programs. The World Bank has responded to the challenge by proposing a new strategy to address the problem of access to energy for the poorest. This strategy was presented in the 1996 paper "Rural Energy and Development—Improving Energy Supplies for Two Billion People." However, as this paper notes, the World Bank cannot do much by itself. It is necessary that all those involved in the rural energy sector work together to make sure that we can be successful.

To that end, a Rural Energy Roundtable was organized by ESMAP and the World Bank from April 16-18, 1997, at the World Bank's headquarters in Washington, D.C. It attracted a substantial participation from practitioners all over the world who during the three-day discussion provided invaluable inputs on how to put the proposed strategy into practice. The Rural Energy Roundtable was organized by Willem Floor, Senior Energy Planner, with support from rural energy specialists around the World Bank. The present report was prepared by Gerald Leach, Rural Energy Advisor.

Abbreviations and Acronyms

COU	consumer-owned utilities
ESCO	energy service company
GEF	Global Environment Facility
JFM	joint forest management
LPG	liquid petroleum gas
NGO	non-governmental organization
OECD	Organization for Economic Cooperation and Development
PAPP	Programa de Apoio ao Pequeño Produtor (Support Program for Small Producers)
RET	renewable energy technology
SHS	solar home system

Introduction

The daunting challenge of rural energy makes easy headlines. Over two billion people lack access to electricity. Over two billion rely on biomass fuels for lack of better alternatives. Modern energy would transform their living standards and is an essential condition of rural development. But poverty puts it beyond the reach of most of these huge populations. Lower cost technologies, good access to credit, effective technical support services, and new policy and institutional environments to put all these in place have to be developed if most rural people are to gain the benefits of modern energy.

Governments and many other institutions, including the World Bank, have worked on these issues for many years. But success has been mixed. Traditional energy has proved particularly difficult, not least because it has often been misdiagnosed as an energy problem rather than one aspect of typically complex systems of multi-purpose land use. Rural electrification has been hampered by low tariffs which have crippled many power utilities and their ability to finance grid extensions, while at the same time undermining private power supply initiatives. In the early 1990s revenue shortfalls in developing countries due to low tariffs averaged about US¢ 6 per kWh and totaled US$ 100 billion a year. Hundreds of top-down government demonstration projects have collapsed because they failed to provide supporting repair and maintenance services, or simply delivered unaffordable and inappropriate technologies.

In 1996, the World Bank re-confirmed its commitment to meeting the rural energy challenge with the publication of its Best Practice paper: Rural Energy and Development: improving energy supplies for two billion people. The time seemed ripe for this renewed call to arms. The global paradigm shift from central planning to market-led private sector responses continues to gather pace. New mechanisms for delivering, supporting and financing technologies are growing and flourishing. Restructuring and energy price reform have increased fair competition and opened up new rural markets to well-designed business initiatives. Renewable energy technologies, already competitive with conventional approaches in many rural situations, continue to become cheaper and more reliable.

Yet despite these encouraging moves, further change is needed and many difficulties remain. At the same time, the rural energy agenda is so new that many options are open to explore. Certainly all those involved in rural energy seem to agree that they still have much to learn about how best to do it. The World Bank therefore decided that a useful sequel to its Development in Practice paper "Rural Energy and Development, Improving Energy Supplies for Two Billion People" would be to get together a good mix of people with practical experience to share their ideas on how to advance the rural energy agenda.

Hence this Rural Energy Roundtable, which was organized by the Power Development, Efficiency & Household Fuels Division (IENPD) of the World Bank's Industry and Energy Department, held at the World Bank's headquarters, and timed to fit with several renewable energy and energy efficiency meetings in Washington, D.C. Some 26 speakers were included in the two-and-a-half days of the meeting: 4 from the World Bank, 8 from the Organization for Economic Cooperation and Development (OECD) countries, and 14 from developing countries.

This brief account of the meeting does not attempt to summarize the content of each and every presentation. Neither does it dwell for long on the many areas of common ground which were revealed during the Roundtable, except where it might be useful to note that these were indeed consensus issues . Rather it seeks to draw out the most important issues which emerged, the degree of consensus on these and, more interestingly, the areas of difference and contention.

Main Issues and Findings

The meeting was structured into five half-day sessions which covered emerging areas of interest in the developing rural energy agenda:

- Rural Energy Policy & Institutional Development
- Joint Forest Management
- Rural Electrification—Extending the Grid
- Rural Electrification—Non-Grid Options
- Post-Power Sector Reform and Rural Households.

Each session began with a short overview of the main issues. These were followed by a handful of brief presentations by invited speakers which were designed to expand on the keynote issues by reflecting practical experience gained from programs or projects, mostly in developing countries. As expected, from this process there emerged a number of topics of repeated interest or concern, the pervasive burning issues of the meeting. Although these are covered in some detail below in the descriptions of each session, they are collected together here in outline form.

Reform cannot be rushed

No participant questioned the assumption that governments must loosen their control and management of rural energy provision. But serious questions emerged on how rapidly this can, or should be allowed to, happen. In China, India and sub-Saharan Africa the move to market-based rural energy development is severely constrained by weak rural capacities and infrastructure. What mix of new rural institutions and structures should be built up to replace the government system? How quickly can effective systems be put in place? And what roles should government retain in a transition period? These questions were raised but not resolved.

The public sector is doing well on the small scale of power co-operatives

Rural electricity co-operatives are flourishing in several developing countries. They are also expanding their early role as consumers of grid-based power into a wide range of supply side activities, including independent power production from renewable sources such as biomass. But government hostility or neglect, financing problems and other difficulties are major barriers to the development of co-operatives in some countries. Better support for co-operatives, versus support for other private sector approaches, is a major policy question which has not been adequately addressed.

Good technical support is critical

Many rural energy technologies, some renewable systems especially, are not yet technically mature. They can be hard to install and prone to failure without skilled operators or maintenance. The need for strong training and technical support services is paramount, whether the technologies are managed by private operators, a local co-operative or a public utility. Several models were discussed and others are also being tried out in the field. But it is too early for generalisations on which might work best.

Good financial services are critical

A repeated theme was the strong desire amongst rural people for basic electricity services. But while they will often pay relatively high prices for electricity, they can rarely meet its high initial costs. As with technical support services, many innovative credit financing methods are being tried out. Some of these, such as energy service companies (ESCOs), can look after technical support as well as financing for rural energy supply systems. The financing specifically of rural energy activities must fit into—and certainly not divert attention from—the development of much broader rural and national financial markets.

Biomass lacks glamour

The session on forestry and traditional biomass fuels played to a half-empty hall, even though it addressed the sustainable management of the principal energy source in most developing countries. In other sessions modern biomass energy was hardly mentioned amidst all the talk of solar homes and wind-powered communities, despite its major advantages, including supplies of firm power without the need for unreliable batteries and the creation of local jobs for biomass supply. But perhaps this disinterest was peculiar to this particular audience, as there have been many lively biomass energy conferences.

Key Points from the Sessions

Session I: Rural Energy Policy & Institutional Development

Following a lively review of rural energy issues by Karl Jechoutek (Division Chief, IENPD) two images came to dominate this opening session:

- One was the continuing struggle by two vast countries, China and India, with a combined rural population of 1,600 million, to throw off top-down, centralized energy planning in favor of more open, flexible and market-led approaches. Problems have been formidable and remain, confirming the cliché that cultural revolutions are not finished overnight.
- The second was the rural population income pyramid, with a rich minority at the tip and the poor majority weighting the base. This image emerged here as a potent symbol for the whole meeting on which many theories, assertions and hopes were pinned.

The presentation on China, by Gu Shuhua and Lin Junfeng, revealed a country poised awkwardly between the safe shores of government planning and what someone later called the "shark-infested waters" of the market and privatization. A huge and elaborate structure now tries to steer rural energy development, centered on improving energy efficiency and expanding many renewable energy technologies (RETs). It includes eight coordinating ministries and thousands of offices reaching down from the provincial to the county, district, township and village levels. One of their main functions is to ease the adoption of renewables by helping rural people overcome the many technical and economic barriers which now prevent it. Despite these problems and government recognition that the sustained growth of renewables must depend "ultimately" on the development of open, competitive rural energy markets, ambitious planning targets for renewable energy growth have been set for 2000 and 2010.

In India, a similar constrained paradigm shift is under way. J. Gururaja made a strong case that while government has already done much to promote competition and private sector initiative, it cannot go as far or fast as it—or outside observers—might wish. Effective alternatives to central planning must first be put in place. As in China, the pace of change is severely constrained by under-developed rural markets with weak local technical capacities, supportive infrastructure and credit systems. A major policy issue, so far unresolved, is what mix of institutions, at what scales, could best support the emerging market environment, including new state and local government entities, village level organizations such as cooperatives, and non-governmental organizations (NGO).

In sub-Saharan Africa, Youba Sokona argued that weak energy institutions and infrastructure (including manufacture, sales, distribution, financing and maintenance) are also seriously impeding moves toward private sector and market-based development. At

the same time they help to prolong donor-driven projects as a substitute for national rural energy policies. However, since the early 1990s there have been some encouraging private sector developments amidst a sea of project failures.

The Programa de Apoio ao Pequeño Produtor (Support Program for Small Producers; PAPP) in Brazil, described by Francisco Martins, is an exciting example of the private sector and participatory models which these other presentations called for. In north-east Brazil, communities can chose how to spend their social development grants. In the PAPP's program region (population two million), 45% of the projects implemented under this scheme involved electricity supply. Furthermore, most communities chose off-grid renewables rather than grid extension. Although resting on public sector support, the program has brought power to the poorest rural families by a dynamic combination of community choice, competitive private sector bidding, and effective rural credit polices.

Three other notable points emerged from these presentations and the discussions around them:

First, in some places the diffusion of renewables may be going too fast. In the context of rural China, most such technologies were said to be too costly, prone to failure and difficult for most rural people to install and operate. Training and information transfer to overcome these major barriers are the most important functions of the Chinese network of rural energy offices. In China, India and Africa poor repair and maintenance services are amongst the most severe barriers to the adoption of RETs. This is less commonly the case with their more robust competitor, the diesel generator set. These perspectives contrasted sharply with the assertions by others at the Roundtable that most RETs now being deployed the rural areas of developing countries are technically mature and simple, robust and easy to run.

Second, subsidies seem to be alive and well—but increasingly suspect. In China, taxes and subsidies which discriminate against renewables in favor of fossil fuels are seen as the most important single constraint on the move towards healthy rural energy markets. However, some preferential taxation might still be needed to promote rural energy industries, adding to the small subsidies and tax breaks which are now available for wind, PV and household biogas. In India, subsidies are a central but unresolved issue. Known to be magnets for malpractice and sops to the rich rather than their intended targets, the poor, they are seen as necessary in the short run—but not the long run—to get new marginal technologies adopted.

Third, while the potential market for modern rural energy technologies is clearly enormous, we have hardly scratched its surface. In China, the promotion of rural energy efficiency and RETs in the largest-ever campaign mounted by the government, managed in the 8th Five-Year Plan (1991-95) to create new renewable energy supplies equivalent only to an annual 10.8 million tons coal equivalent. In India, wind power has grown in the past eight years to an impressive 750 MW but (excluding large hydro) a decade of government investment and effort has led to only 1,000 MW of renewable power capacity, equivalent to one medium-large power plant. Success stories of village wind

and PV projects presented to the meeting were measured in a very few 10s of kW capacity at best. Living at the foot of an S-shaped growth curve is frustrating as well as exciting.

Humbling statistics like this helped to trigger the first of many remarks centered on the rural income pyramid. How realistic is the goal of providing modern energy services to all of the rural billions—that is, ahead of long term income development which will one day provide them anyway, without special rural energy programs? If the upper-income segment can afford high-cost energy solutions without assistance, and the middle-income center can afford them with good marketing and financing, how does one reach the low-income majority without large—but neither likely nor sustainable—subsidies? One line of response was: continue the subsidies and don't forget the humanitarian basis of public aid to development. Another: it's the wrong question. We should be asking not how to provide for all but how to increase access for all to improved energy services. Yet another was to depend even more directly on trickle down. With solar home systems, for example, the best strategy is to go for the richer top half and wait for a second-hand market top develop for the bottom half. Many others hoped, or asserted, that quality services could be delivered far down the pyramid through some combination of falling technology costs, further cost cutting through reduced service standards, and improved financing. But no proofs or clear answers emerged.

Session II: Joint Forest Management

Despite a major change of subject, this session emphasized some of the same key issues as Session I:

> Above all, it emphasized the need not only for governments to hand over the controls of rural energy to many more stakeholders, but also the radical and sometimes surprising shifts in thinking that this can demand.

Unfortunately, while sparking off many interesting and novel ideas , the session had the smallest audience of the whole meeting. Are forests and traditional fuels that boring, or lacking in business or project opportunities?

Trees are the basic resource for traditional energy, the fuel for some two billion people. Many trees—in some countries, most trees—are owned and managed sustainably by rural people. The remainder, typically forests on public land, are normally "controlled" by government in order to extract revenues from legalized commercial extraction and to protect them from illegal over-exploitation. In practice, these agencies are far too weak for the task, so many forests continue to be open-access resources which anyone can exploit as a free good. The massive loss and degradation of public forests in many countries testifies to the profound failure of this neo-colonial mind-set.

Joint forest management (JFM) has grown like a phoenix from these failures. Well-matched to the broad privatization agenda, its basic "care and share" philosophy aims to give greater use rights, management functions and policing responsibilities for forests to

local communities. The latter work in joint partnership with public sector agencies, with widely varying types and degrees of management control. Importantly, the community can charge for resource use, splitting revenues with government, thus replacing the disasters of uncontrolled zero-revenue open-access with (hopefully) sustainable resource revenues.

While JFM might seem like an easy and politically popular winner, there are many barriers to successful implementation. These were outlined by the session's opening speaker (Bob Winterbottom). For participating communities they include: willingness to cooperate with each other, to invest their labor and cash resources, and to organize for and learn new management skills. Government, on the other hand, must be prepared to weaken greatly its own jurisdiction and authority over basic national resources. JFM requires from government a strong commitment to more equitable tenure or access to land and land-based resources, increased local accountability and community powers, openness to and policy support for the emergence of NGOs and private entrepreneurs, and willingness to explore many technical and administrative innovations, including the redistribution of tax revenues from the state to local communities.

India is perhaps the global showcase for JFM and forest policy reform. According to Nairesh Saxena, who presented the India JFM case, some 40,000 village communities are now protecting about 4.5 million hectare of forest, under a wide range of land lease or land sharing arrangements with forest departments. Profound and courageous reversals of policy have led to this situation. Up to 1988 government policy was to manage state forests for timber and industrial materials and to protect them from over-exploitation by local people. This had clearly failed. Most over-exploitation was anyway by illegal urban and industrial raiders. In that year a new policy process was begun which treated local people as the solution and not the problem. The source of timber and pulp production was switched to farm plantations, while forests were managed not to earn revenue but for their environmental and ecological benefits and to meet the minimum needs of local people for firewood and fodder, etc. As a result, the Indian forest area is now stabilized (and possibly increasing). This huge advance from old worries about eco-suicide and energy crisis has been brought about not by massive government investments but by a mental revolution followed by the creation of new markets, patterns of ownership and institutional environments.

However, India's radical forest policy reforms need to be taken further if the full benefits and large remaining potential for JFM are to be secured. The legal rights of all participants in forest protection must be more sharply defined. Government must loosen its monopoly hold on the market for non-timber forest products, encouraging competition. On the other hand, as the value of this market grows alongside increasing numbers of resource users, mechanisms must be created both to ensure equitable distribution of benefits and resolve conflicts. In short, the market cannot become a free-for-all but must be strongly regulated for the common good. That in turn requires still

greater commitment than now by politicians and bureaucrats to JFM's basic concept of empowering the people.

In the case of Latin America, presented by Rogerio Miranda, a rather different perspective emerged on the scope for public and private sector partnerships for resource use. Far more than in India, governments have ignored the fuelwood sector, with the usual dire results. Fuelwood is taken free from open-access forests so that its price is too low to encourage private production. But in Nicaragua and Costa Rica at least, farmers and communities have now begun to organize their own solutions, with some remarkable successes. So long as wood demand is high and there are no strong competing uses for land, where rural people have managed to develop good access to credit, guaranteed markets and fair prices, farmers and communities are growing wood profitably and sustainably both for the cooking fire and biomass-based rural electrification schemes. This self-help community spirit is spreading and sees no need for government assistance. Indeed, independence from external interference (especially by bureaucrats) and access to local financing as opposed to foreign aid have been two key ingredients of success.

Session III: Rural Electrification—Extending the Grid

Despite another sharp change of topic, the same questions of who "does" and who "owns" development carried over into this session, in which three key themes emerged:

- What are the best institutional structures between the extremes of state control and unregulated markets?
- What is electricity's real place in development. Is electricity provision more a welfare issue (and therefore deserving of state support) or is it such a powerful dynamo for wealth creation that it can and should be allowed grow up on its own financial feet?
- The huge potentials for cutting the costs of grid extension (and off-grid renewables) was first raised in this session.

Gerald Foley's overview on rural electrification raised these issues with concise clarity, starting with two warnings. First, never underestimate the quality of service which the grid can provide (in contrast to intermittent renewable sources plus batteries, the topic of the following sessions). Second, never undertake rural electrification prematurely, as is the case in many developing countries. It should be considered as a priority option only when urban areas are substantially electrified and providing a good revenue base, and when rural areas are ready for it. Since rural electrification does not in itself cause development—just as putting up diesel pumps in a desert doesn't bring a bus service—readiness means that rural economic development has reached a level where markets have already started up for electricity services such as lighting; e.g. where there are sizable expenditures on kerosene, dry cell batteries, car battery charging and even the occasional diesel generator set.

The statement that rural electrification is not a cause but an essential ingredient of rural development was broadly accepted as the consensus of the meeting. However, the corollary that rural electrification must have a major role in the policy and project dialog in other rural sectors, such as health, schools and water supply, was not followed through. Neither was the important question of how local perceptions of rural electrification as a crucial development component should affect the economic evaluation of rural electrification schemes. Some later presentations—notably on rural electrification cooperatives in Bangladesh (Session III) and on micro-hydro in Peru (Session IV)—provided convincing survey evidence that people regard electricity as the highest priority infrastructure development, partly because it increases living standards directly and also more strongly than does income growth, one of the principal yardsticks of rural electrification economic benefits. Further, rural electrification can also directly support income growth through many business and employment activities which are unpredictable. Neither of these factors can easily be incorporated into rural electrification project evaluations. An even sharper dig at conventional evaluations arose from the observation that much of the power demand in cities is for household lighting. If analysts do not worry about "unproductive" electricity use there, why do so in villages? Indeed, it was even suggested that doing away with spurious distinctions between the productive and the welfare benefits of rural electrification would not only greatly simplify rural electrification project appraisals; it would also avoid the time now wasted by project proposers on trying to invent future productive uses of electricity! Bernard Devin, in the keynote speech to Session IV, did much to clarify this issue by drawing a distinction between energy services which helped to trigger development—the "unlocking step" (déverrouillage), such as better lighting or relief from time-consuming tasks—and the later, more powerful "take-off step" (décollage) which underpinned "productive" income-generating activities. Both steps are necessary for "development".

The essence of Foley's keynote message, though, was that the hotly-debated institutional structure of rural electrification is not the major issue. Very different institutional arrangements have worked well as rural electrification models, including cooperatives in the Philippines, Bangladesh and Costa Rica, the national power utility in Ireland and large parts of Costa Rica, and a separate utility in Thailand. Whatever institution takes on rural electrification, much more important is its freedom from political interference over engineering and financial matters, a clearly defined budget which it is allowed to control fully, and a high degree of accountability. Also essential is an effective regulatory framework in which tariff and cost increases must be justified. Operating subsidies should be avoided like the plague, and though initial capital subsidies can sometimes make sense, cost recovery of all operating and grid expansion costs should be the cardinal rule.

Despite all this, the key question of "who does it?" remains. Foley waved a red flag at some of the assembled bulls by asking if we can expect large scale rural electrification, for the largest possible number of people within given budget constraints, many of them offering almost zero returns, typically requiring commitments measured in decades, to

match the goals of the private sector, which are to maximize profits. Although much of the work can with advantage be done by the private sector, should the whole endeavor be privatized? Much ensuing debate and sniping failed, not surprisingly, to reach agreement.

The two following presentations, however, were a sharp reminder that the public ownership paradigm is far from dead but is alive and doing very well in some places in the shape of rural electrification cooperatives. Presenting the Bangladesh case, Chris Ratnayake showed how the appalling financial and technical failures of the public power utilities led in 1980 to the government-supported takeover of its own parastatals by rural electrification cooperatives based on the U.S. model. Now numbering 45, in 16 years they have engineered a rapid expansion of grid-based rural electrification supply, which now serves 1.6 million consumers, as many as the public sector in urban areas. Power losses have fallen dramatically, while revenue collection has improved from 91% to 98%, despite higher tariffs. Most importantly, the cooperatives have created and fostered an alternative culture and structure which meets a demand which was previously unexpected in such a poor country: high consumer aspirations for electricity and a high consumer willingness to pay for reliable service. In Costa Rica, as described by Misael Monge, a somewhat similar story has unfolded. Four rural electrification cooperatives were launched in 1970 and are now supplying 11% of the country's electricity consumers, 6% of the demand, and have electrified between 93% and 100% of their service areas. Together with private power producers, they are growing rapidly.

Lessons to be learned from these success stories begin with the obvious need for positive and sustained government support. This is not forthcoming everywhere in Latin America, for example, where prospects for rural electrification cooperatives might therefore be quite limited. Tariffs must cover the full costs of service and its expansion and must also guarantee a high quality service. Subsidies should be a last resort, and then only for capital costs. In Costa Rica even these are avoided by good credit facilities for consumers; e.g. to pay for line extensions to their home or farm. Most importantly, the ultimate lesson of rural electrification cooperatives is that when people are able to take part in their own infrastructure development—to work with and for the public "common wealth"—they care about it and care for it.

The scope for cost-cutting in rural electrification schemes was raised by Hachemi Essebaa in his presentation on Tunisia. By adopting techniques developed in the United States, the costs of medium volt (30 kV) grid extension have been cut by 30-40%, leading to overall cost reductions of 18-24%. In the final session (V), Noel Tobin reviewed the many technical rural electrification design options, from transmission lines through to metering, and how these could lower costs. Summarizing, one speaker remarked that you can reduce rural electrification costs significantly and across the board—so long as you concentrate on reducing costs. Cost reduction was also the main theme of a presentation in Session IV, by Theodoro Sanchez-Campos, on micro-hydro in Peru. System costs can be cut by roughly 50% without sacrificing safety or service standards by careful design, competitive tendering for materials and parts, and avoidance of drastic overdesign ("goldplating") or excessively stringent government norms and standards.

Session IV: Rural Electrification—Non-Grid Options

This was the session for renewable power technologies—and it left no doubts about people's interest in them. The meeting room was packed. The session was also the fullest in terms of presentations, with a keynote talk (Bernard Devin); three talks on institutional questions, including utility models (Jorge Huacez), NGOs and energy service companies (ESCOs) (Richard Hansen) and private sector approaches (Rob de Lange); and four technical presentations, on solar lanterns (Daniel Kithokoi), Micro-hydro (Theodoro Sanchez-Campos), small-scale wind power (Mike Bergey) and PV standards (Peter Varadi).

From this medley, three strong themes emerged during the session:

- Much is happening with renewable energy implementation but we are still only learning to walk. Much more time and work is needed to develop the best matches between resources, technologies and the socio-economic environment of potential markets.
- Most renewable projects are small with large overhead costs. There are many possible ways to speed and expand progress, but little agreement on the best models.
- System scale for renewables—ranging from small-power solar lanterns to mini-grids—will be an increasingly important issue as demand grows.

The first theme said, in effect, that one cannot chart where revolutions will go. Many renewable energy development paths are being and could be taken but it is too early now to be dogmatic about the best way to go in any one place. Continued innovative experimentation (without harming consumers) is needed carefully to match renewable resources, technologies and system designs with consumer income, population density, distance from existing grids, and so forth. There are many possible energy technology and resource combinations for doing this, many of which are now economic in favorable circumstances: solar, wind, mini-hydro, biomass, diesel, and various combinations and hybrids. Batteries remain a persistent problem because they are easily abused by poor management, reducing their lifetime and reliability. Yet, curiously, almost no-one spoke up for biomass electrification as a solution to the energy storage problems of intermittent solar and wind resources. As noted above, biomass (for this audience) is not seen as a major player

The second theme was how to speed progress on renewables. While learning to walk we are taking very small but also very costly steps which are dwarfed by the enormity of the potential need across the rural Third World. Large efforts are now going into useful but small renewable projects, often for a few kW for a village system. Transaction costs are high. At the same time, many projects seem also to be expensively failing to heed lessons learned elsewhere.

Views on this issue varied considerably. One experienced practitioner (Mike Bergey) urged "don't rush it. Slow and steady wins the race". In his view, echoed by others, a crucial aspect of sustainable renewables growth is to develop local technical, financial and managerial skills and institutional capacities to support home-grown take-off. This takes time and can fail if hurried too much. Richard Hansen, while fully supporting the need for capacity building, argued for something akin to the ESCOs which are now commonplace on the energy efficiency front. Renewable ESCOs would link technologies to rural recipients by providing equipment, installing and maintaining it, and collecting money for the service. Hansen cited examples of ESCOs which provide this comprehensive service for solar home systems (SHS) in the 15-50 Watt range for a set monthly fee of up to US$ 20.

A somewhat similar model for technology delivery and support was proposed by de Lange. Talking of SHS in Indonesia, he argued for a well-dispersed network of private sector SHS technology service centers, with one three-staff center for a minimum of 300 50W home systems. These plus good credit systems could probably reach 30-50% of the 25 million Indonesian rural households which lacked electricity but topped the income pyramid—a potential market of around 375-625 MW.

A third and contrasting view, from Bernard Devin, advocated some form of private/public twin-track model. Private-sector business models may be best for reaching the upper income rural market, but diffusion down the pyramid is the key issue for "equity and social development reasons". Public development aid is designed to do this but is slow and not sustainable. The main concern should therefore be to find effective ways of bundling together both approaches and their respective actors: consumers and consumer groups such as cooperatives, entrepreneurs, the public sector for financing and the power utilities.

Other conditions which were proposed for sound renewables development were far less contentious. Good support and maintenance services were universally seen as critical to success, but more experience is needed on their design, scale and costs, etc. Customer feedback is vital to technology design and selection and market development. The demand in Indonesia for larger than expected SHS systems is a good case in point. Ability to pay and good access to financing were other often-repeated requirements for market growth. On this score, Richard Hansen gave a telling statistic that in the Dominican Republic some 50% of rural households can afford to lease home PV systems but only 5% can afford to buy them outright.

System scale is related to this and was the third main theme of the session. The choice is wide: wire-less stand-alone units, micro-grids, mini-grids, and eventually, grid connection with sale of surplus renewable-based power. But the important question of how one matches initial system scale to potentially rapid demand growth hovered in the background and was never directly addressed. It's relevance was driven home by the common finding (e.g. with solar lanterns in Kenya and solar home systems in Indonesia) that once consumers have tasted the benefits of renewable-based electric lighting and

other services, they want much more. Do they get it by doubling or trebling their stand-alone units, or from a larger-scale local grid with its economies of scale? A warning on the risks to renewables development of getting this wrong was given by de Lange. If solar home systems in Indonesia cannot deliver a fairly hefty 400-500 Watt-hours per day, solar energy will be perceived as a temporary and inferior solution until the grid arrives. Indeed, consumers have expressed reluctance to go for inferior, smaller solar systems when the advancing grid is still as much as 50 km away.

Session V: Post-Power Sector Reform and Rural Households

This final session was intended to advance and clarify the basic issues of who, in a world of power sector reform, are the main actors of rural electrification, and what new structures are needed beyond sector reform. The main message was that from sound experience we know what bits and pieces are needed and what works best. The task, as Karl Jechoutek put it in his final summary, is to stop talking and start doing. Presentations and discussions put in evidence the needs for:

- well-tailored policies and regulations to ensure that electrification by the private sector meets social goals;
- reducing electrification costs, which has a huge potential;
- broadening energy practitioners perspective beyond financing and to include financial markets development.

The keynote presentation, by Peter Cordukes, reminded how power sector reform has fundamentally changed the incentives and responsibilities for rural electrification. Typically, before energy sector reform the state electricity utility was mandated to conduct rural electrification programs supported by government loans and grants. Such programs resulted in large subsidies to consumers and substantial financial losses for the utilities. In a market-driven post-sector reform era, the high cost and low-return of rural electrification is no longer a utility priority. Measures which in the past had driven utility electrification programs are now frowned upon: operating subsidies are suspect; prices are determined by regulators relying on sound financial principles and no longer by governments guided by social preoccupations. Thus, there is a need today to rekindle some enthusiasm for rural electrification. Clearly, consumer prices have to be raised. Competitive efficiency can keep these prices at reasonable and affordable levels. Regulators should allow tariffs high enough to provide for grid extension and reasonable profits for operators. New concessions for grid extension could be offered to expand the market (with clear rules and procedures). More stand-alone (off-grid) power plant construction should also be permitted.

Cost reductions were the dominant theme for the remainder of the session. Such cost reductions can be achieved by technical means (as noted above) or by improving financial markets and their access. Martin Crowson made a convincing case for consumer-owned utilities (COU or cooperatives) to join their efforts and raise their status in capital

markets, as U.S. rural electric cooperatives did in the early 1970s when they formed the National Rural Utilities Finance Corporation. Particularly in Latin America, where COUs are ignored by government, this would help them overcome the daunting obstacles they face in raising sufficient funds to meet their responsibilities. These obstacles include weak and ill-organized national capital markets; loan individually too small to access competitive terms; and the reliance on U.S. dollar based loans with high exchange risks. The hard loan conditions demanded by conventional banks to finance renewables and small private power operators was discussed. Interestingly, it was suggested without much opposition, that such conventional bank loans could be complemented by public financing, or even some form of subsidy.

A high point in the session was an authoritative review by Jacob Yaron of rural financial markets. Subtly but firmly, Yaron questioned the waves of special pleading by rural energy devotees—at this meeting and in many other places—for favorable financial markets and priviledged access to credit. The provision of affordable financial services for rural populations has been a prime component of development strategy for many decades, as a major tool for accelerating growth and reducing poverty. Recently the practical core of this concept—provision of concessional loans to farmers—has been replaced by much wider financing for broader rural activities to reduce transaction costs, integrate rural financial markets with general financial markets, and mobilize voluntary savings as the main capital resource for rural population instead of concessional donor or government funds. Urban-biased policies, Yaron said, often form the main obstacle to the promotion of rural financial institutions and their ability to serve better the rural population. It would be a pity, one might add, if narrow energy-centric policies and lending—even for the best of environmental and developmental reasons—had a similarly disruptive effect.

Conclusions: The Way Ahead

Perhaps the strongest message from the meeting was that rural energy—or at least its renewable energy and electrification components—is moving fast. Much is happening on the ground. Even more is happening in people's minds. New ideas and talks on what to do and how best to do are beginning to win out over old paradigms, although the new pathways they are taking us along remain largely uncharted.

So where are we aiming next? In his closing remarks, Karl Jechoutek walked around this question by asking what of the old energy culture we should keep and what we should discard. In developing countries, most energy programs and projects are still centrally driven and subsidized in many ways. The old planning paradigm is still well alive and kicking, in part because some of its results are positive. Energy's cultural revolution should focus on what has proved to work, including:

- Support for R&D and "commercialization";
- Nurturing young technologies onto the market;
- Information, training and broader capacity building;
- Consumer protection, e.g. by private sector regulation;
- Rural energy as an instrument for rural development and poverty alleviation.

But it should discard these approaches which smother innovation, efficiency, entrepreneurship and consumer choice, including:

- Blanket subsidies;
- Central detailed planning;
- Restrictive regulation.

Subsidies, the dreaded S-word, had raised fierce debate during the meeting. Again, Jechoutek urged, they are neither all-good nor all-bad. The Global Environment Facility (GEF) is widely thought to be a "good" subsidy. But is this so under all circumstances? Operating cost subsidies are frowned upon because they are addictive and distort competition. But what about selective subsidies on capital costs? These are "good" subsidies, and they must be kept. The real question is how subsidies can be well targeted, focused and made to self-destruct when no longer needed.

Central planning and the public sector also have a place—so long as attitudes are suitably transformed. Above all, they should be steered towards nurturing and supporting private sector initiatives and consumer participation and choice. Well-meaning, top-down projects may look good at first sight, but they may also undermine local business initiatives which would have done better. The public sector can do much to support the latter approach with little money by focusing on policy change, deregulation, awareness raising and capacity building. The private sector can deliver—but only if it can function in a favorable environment. And only the public sector can provide that.

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ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

LIST OF REPORTS ON COMPLETED ACTIVITIES

Region/Country	*Activity/Report Title*	*Date*	*Number*
	SUB-SAHARAN AFRICA (AFR)		
Africa Regional	Anglophone Africa Household Energy Workshop (English)	07/88	085/88
	Regional Power Seminar on Reducing Electric Power System Losses in Africa (English)	08/88	087/88
	Institutional Evaluation of EGL (English)	02/89	098/89
	Biomass Mapping Regional Workshops (English)	05/89	--
	Francophone Household Energy Workshop (French)	08/89	--
	Interafrican Electrical Engineering College: Proposals for Short- and Long-Term Development (English)	03/90	112/90
	Biomass Assessment and Mapping (English)	03/90	--
	Symposium on Power Sector Reform and Efficiency Improvement in Sub-Saharan Africa (English)	06/96	182/96
Angola	Energy Assessment (English and Portuguese)	05/89	4708-ANG
	Power Rehabilitation and Technical Assistance (English)	10/91	142/91
Benin	Energy Assessment (English and French)	06/85	5222-BEN
Botswana	Energy Assessment (English)	09/84	4998-BT
	Pump Electrification Prefeasibility Study (English)	01/86	047/86
	Review of Electricity Service Connection Policy (English)	07/87	071/87
	Tuli Block Farms Electrification Study (English)	07/87	072/87
	Household Energy Issues Study (English)	02/88	--
	Urban Household Energy Strategy Study (English)	05/91	132/91
Burkina Faso	Energy Assessment (English and French)	01/86	5730-BUR
	Technical Assistance Program (English)	03/86	052/86
	Urban Household Energy Strategy Study (English and French)	06/91	134/91
Burundi	Energy Assessment (English)	06/82	3778-BU
	Petroleum Supply Management (English)	01/84	012/84
	Status Report (English and French)	02/84	011/84
	Presentation of Energy Projects for the Fourth Five-Year Plan (1983-1987) (English and French)	05/85	036/85
	Improved Charcoal Cookstove Strategy (English and French)	09/85	042/85
	Peat Utilization Project (English)	11/85	046/85
	Energy Assessment (English and French)	01/92	9215-BU
Cape Verde	Energy Assessment (English and Portuguese)	08/84	5073-CV
	Household Energy Strategy Study (English)	02/90	110/90
Central African Republic	Energy Assessement (French)	08/92	9898-CAR
Chad	Elements of Strategy for Urban Household Energy The Case of N'djamena (French)	12/93	160/94
Comoros	Energy Assessment (English and French)	01/88	7104-COM
Congo	Energy Assessment (English)	01/88	6420-COB
	Power Development Plan (English and French)	03/90	106/90
Côte d'Ivoire	Energy Assessment (English and French)	04/85	5250-IVC
	Improved Biomass Utilization (English and French)	04/87	069/87
	Power System Efficiency Study (English)	12/87	--
	Power Sector Efficiency Study (French)	02/92	140/91
	Project of Energy Efficiency in Buildings (English)	09/95	175/95

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Ethiopia	Energy Assessment (English)	07/84	4741-ET
	Power System Efficiency Study (English)	10/85	045/85
	Agricultural Residue Briquetting Pilot Project (English)	12/86	062/86
	Bagasse Study (English)	12/86	063/86
	Cooking Efficiency Project (English)	12/87	--
	Energy Assessment (English)	02/96	179/96
Gabon	Energy Assessment (English)	07/88	6915-GA
The Gambia	Energy Assessment (English)	11/83	4743-GM
	Solar Water Heating Retrofit Project (English)	02/85	030/85
	Solar Photovoltaic Applications (English)	03/85	032/85
	Petroleum Supply Management Assistance (English)	04/85	035/85
Ghana	Energy Assessment (English)	11/86	6234-GH
	Energy Rationalization in the Industrial Sector (English)	06/88	084/88
	Sawmill Residues Utilization Study (English)	11/88	074/87
	Industrial Energy Efficiency (English)	11/92	148/92
Guinea	Energy Assessment (English)	11/86	6137-GUI
	Household Energy Strategy (English and French)	01/94	163/94
Guinea-Bissau	Energy Assessment (English and Portuguese)	08/84	5083-GUB
	Recommended Technical Assistance Projects (English & Portuguese)	04/85	033/85
	Management Options for the Electric Power and Water Supply Subsectors (English)	02/90	100/90
	Power and Water Institutional Restructuring (French)	04/91	118/91
Kenya	Energy Assessment (English)	05/82	3800-KE
	Power System Efficiency Study (English)	03/84	014/84
	Status Report (English)	05/84	016/84
	Coal Conversion Action Plan (English)	02/87	--
	Solar Water Heating Study (English)	02/87	066/87
	Peri-Urban Woodfuel Development (English)	10/87	076/87
	Power Master Plan (English)	11/87	--
	Power Loss Reduction Study (English)	09/96	186/96
Lesotho	Energy Assessment (English)	01/84	4676-LSO
Liberia	Energy Assessment (English)	12/84	5279-LBR
	Recommended Technical Assistance Projects (English)	06/85	038/85
	Power System Efficiency Study (English)	12/87	081/87
Madagascar	Energy Assessment (English)	01/87	5700-MAG
	Power System Efficiency Study (English and French)	12/87	075/87
	Environmental Impact of Woodfuels (French)	10/95	176/95
Malawi	Energy Assessment (English)	08/82	3903-MAL
	Technical Assistance to Improve the Efficiency of Fuelwood Use in the Tobacco Industry (English)	11/83	009/83
	Status Report (English)	01/84	013/84
Mali	Energy Assessment (English and French)	11/91	8423-MLI
	Household Energy Strategy (English and French)	03/92	147/92
Islamic Republic of Mauritania	Energy Assessment (English and French)	04/85	5224-MAU
	Household Energy Strategy Study (English and French)	07/90	123/90
Mauritius	Energy Assessment (English)	12/81	3510-MAS
	Status Report (English)	10/83	008/83
	Power System Efficiency Audit (English)	05/87	070/87

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Mauritius	Bagasse Power Potential (English)	10/87	077/87
	Energy Sector Review (English)	12/94	3643-MAS
Mozambique	Energy Assessment (English)	01/87	6128-MOZ
	Household Electricity Utilization Study (English)	03/90	113/90
	Electricity Tariffs Study (English)	06/96	181/96
	Sample Survey of Low Voltage Electricity Customers	06/97	195/97
Namibia	Energy Assessment (English)	03/93	11320-NAM
Niger	Energy Assessment (French)	05/84	4642-NIR
	Status Report (English and French)	02/86	051/86
	Improved Stoves Project (English and French)	12/87	080/87
	Household Energy Conservation and Substitution (English and French)	01/88	082/88
Nigeria	Energy Assessment (English)	08/83	4440-UNI
	Energy Assessment (English)	07/93	11672-UNI
Rwanda	Energy Assessment (English)	06/82	3779-RW
	Status Report (English and French)	05/84	017/84
	Improved Charcoal Cookstove Strategy (English and French)	08/86	059/86
	Improved Charcoal Production Techniques (English and French)	02/87	065/87
	Energy Assessment (English and French)	07/91	8017-RW
	Commercialization of Improved Charcoal Stoves and Carbonization Techniques Mid-Term Progress Report (English and French)	12/91	141/91
SADC	SADC Regional Power Interconnection Study, Vols. I-IV (English)	12/93	--
SADCC	SADCC Regional Sector: Regional Capacity-Building Program for Energy Surveys and Policy Analysis (English)	11/91	--
Sao Tome and Principe	Energy Assessment (English)	10/85	5803-STP
Senegal	Energy Assessment (English)	07/83	4182-SE
	Status Report (English and French)	10/84	025/84
	Industrial Energy Conservation Study (English)	05/85	037/85
	Preparatory Assistance for Donor Meeting (English and French)	04/86	056/86
	Urban Household Energy Strategy (English)	02/89	096/89
	Industrial Energy Conservation Program (English)	05/94	165/94
Seychelles	Energy Assessment (English)	01/84	4693-SEY
	Electric Power System Efficiency Study (English)	08/84	021/84
Sierra Leone	Energy Assessment (English)	10/87	6597-SL
Somalia	Energy Assessment (English)	12/85	5796-SO
South Africa Republic of	Options for the Structure and Regulation of Natural Gas Industry (English)	05/95	172/95
Sudan	Management Assistance to the Ministry of Energy and Mining	05/83	003/83
	Energy Assessment (English)	07/83	4511-SU
	Power System Efficiency Study (English)	06/84	018/84
	Status Report (English)	11/84	026/84
	Wood Energy/Forestry Feasibility (English)	07/87	073/87
Swaziland	Energy Assessment (English)	02/87	6262-SW
	Household Energy Strategy Study	10/97	198/97
Tanzania	Energy Assessment (English)	11/84	4969-TA
	Peri-Urban Woodfuels Feasibility Study (English)	08/88	086/88
	Tobacco Curing Efficiency Study (English)	05/89	102/89
	Remote Sensing and Mapping of Woodlands (English)	06/90	--
	Industrial Energy Efficiency Technical Assistance (English)	08/90	122/90

Region/Country	*Activity/Report Title*	*Date*	*Number*
Togo	Energy Assessment (English)	06/85	5221-TO
	Wood Recovery in the Nangbeto Lake (English and French)	04/86	055/86
	Power Efficiency Improvement (English and French)	12/87	078/87
Uganda	Energy Assessment (English)	07/83	4453-UG
	Status Report (English)	08/84	020/84
	Institutional Review of the Energy Sector (English)	01/85	029/85
	Energy Efficiency in Tobacco Curing Industry (English)	02/86	049/86
	Fuelwood/Forestry Feasibility Study (English)	03/86	053/86
	Power System Efficiency Study (English)	12/88	092/88
	Energy Efficiency Improvement in the Brick and Tile Industry (English)	02/89	097/89
	Tobacco Curing Pilot Project (English)	03/89	UNDP Terminal Report
	Energy Assessment (English)	12/96	193/96
Zaire	Energy Assessment (English)	05/86	5837-ZR
Zambia	Energy Assessment (English)	01/83	4110-ZA
	Status Report (English)	08/85	039/85
	Energy Sector Institutional Review (English)	11/86	060/86
	Power Subsector Efficiency Study (English)	02/89	093/88
	Energy Strategy Study (English)	02/89	094/88
	Urban Household Energy Strategy Study (English)	08/90	121/90
Zimbabwe	Energy Assessment (English)	06/82	3765-ZIM
	Power System Efficiency Study (English)	06/83	005/83
	Status Report (English)	08/84	019/84
	Power Sector Management Assistance Project (English)	04/85	034/85
	Power Sector Management Institution Building (English)	09/89	--
	Petroleum Management Assistance (English)	12/89	109/89
	Charcoal Utilization Prefeasibility Study (English)	06/90	119/90
	Integrated Energy Strategy Evaluation (English)	01/92	8768-ZIM
	Energy Efficiency Technical Assistance Project: Strategic Framework for a National Energy Efficiency Improvement Program (English)	04/94	--
	Capacity Building for the National Energy Efficiency Improvement Programme (NEEIP) (English)	12/94	--
	EAST ASIA AND PACIFIC (EAP)		
Asia Regional	Pacific Household and Rural Energy Seminar (English)	11/90	--
China	County-Level Rural Energy Assessments (English)	05/89	101/89
	Fuelwood Forestry Preinvestment Study (English)	12/89	105/89
	Strategic Options for Power Sector Reform in China (English)	07/93	156/93
	Energy Efficiency and Pollution Control in Township and Village Enterprises (TVE) Industry (English)	11/94	168/94
	Energy for Rural Development in China: An Assessment Based on a Joint Chinese/ESMAP Study in Six Counties (English)	06/96	183/96
Fiji	Energy Assessment (English)	06/83	4462-FIJ
Indonesia	Energy Assessment (English)	11/81	3543-IND
	Status Report (English)	09/84	022/84
	Power Generation Efficiency Study (English)	02/86	050/86

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Indonesia	Energy Efficiency in the Brick, Tile and Lime Industries (English)	04/87	067/87
	Diesel Generating Plant Efficiency Study (English)	12/88	095/88
	Urban Household Energy Strategy Study (English)	02/90	107/90
	Biomass Gasifier Preinvestment Study Vols. I & II (English)	12/90	124/90
	Prospects for Biomass Power Generation with Emphasis on Palm Oil, Sugar, Rubberwood and Plywood Residues (English)	11/94	167/94
Lao PDR	Urban Electricity Demand Assessment Study (English)	03/93	154/93
Malaysia	Sabah Power System Efficiency Study (English)	03/87	068/87
	Gas Utilization Study (English)	09/91	9645-MA
Myanmar	Energy Assessment (English)	06/85	5416-BA
Papua New Guinea	Energy Assessment (English)	06/82	3882-PNG
	Status Report (English)	07/83	006/83
	Energy Strategy Paper (English)	--	--
	Institutional Review in the Energy Sector (English)	10/84	023/84
	Power Tariff Study (English)	10/84	024/84
Philippines	Commercial Potential for Power Production from Agricultural Residues (English)	12/93	157/93
	Energy Conservation Study (English)	08/94	--
Solomon Islands	Energy Assessment (English)	06/83	4404-SOL
	Energy Assessment (English)	01/92	979-SOL
South Pacific	Petroleum Transport in the South Pacific (English)	05/86	--
Thailand	Energy Assessment (English)	09/85	5793-TH
	Rural Energy Issues and Options (English)	09/85	044/85
	Accelerated Dissemination of Improved Stoves and Charcoal Kilns (English)	09/87	079/87
	Northeast Region Village Forestry and Woodfuels Preinvestment Study (English)	02/88	083/88
	Impact of Lower Oil Prices (English)	08/88	--
	Coal Development and Utilization Study (English)	10/89	--
Tonga	Energy Assessment (English)	06/85	5498-TON
Vanuatu	Energy Assessment (English)	06/85	5577-VA
Vietnam	Rural and Household Energy-Issues and Options (English)	01/94	161/94
	Power Sector Reform and Restructuring in Vietnam: Final Report to the Steering Committee (English and Vietnamese)	09/95	174/95
	Household Energy Technical Assistance: Improved Coal Briquetting and Commercialized Dissemination of Higher Efficiency Biomass and Coal Stoves (English)	01/96	178/96
Western Samoa	Energy Assessment (English)	06/85	5497-WSO
	SOUTH ASIA (SAS)		
Bangladesh	Energy Assessment (English)	10/82	3873-BD
	Priority Investment Program (English)	05/83	002/83
	Status Report (English)	04/84	015/84
	Power System Efficiency Study (English)	02/85	031/85
	Small Scale Uses of Gas Prefeasibility Study (English)	12/88	--
India	Opportunities for Commercialization of Nonconventional Energy Systems (English)	11/88	091/88

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India	Maharashtra Bagasse Energy Efficiency Project (English)	07/90	120/90
	Mini-Hydro Development on Irrigation Dams and Canal Drops Vols. I, II and III (English)	07/91	139/91
	WindFarm Pre-Investment Study (English)	12/92	150/92
	Power Sector Reform Seminar (English)	04/94	166/94
Nepal	Energy Assessment (English)	08/83	4474-NEP
	Status Report (English)	01/85	028/84
	Energy Efficiency & Fuel Substitution in Industries (English)	06/93	158/93
Pakistan	Household Energy Assessment (English)	05/88	--
	Assessment of Photovoltaic Programs, Applications, and Markets (English)	10/89	103/89
	National Household Energy Survey and Strategy Formulation Study: Project Terminal Report (English)	03/94	--
	Managing the Energy Transition (English)	10/94	--
	Lighting Efficiency Improvement Program Phase 1: Commercial Buildings Five Year Plan (English)	10/94	--
Sri Lanka	Energy Assessment (English)	05/82	3792-CE
	Power System Loss Reduction Study (English)	07/83	007/83
	Status Report (English)	01/84	010/84
	Industrial Energy Conservation Study (English)	03/86	054/86

EUROPE AND CENTRAL ASIA (ECA)

Bulgaria	Natural Gas Policies and Issues (English)	10/96	188/96
Central and Eastern Europe	Power Sector Reform in Selected Countries	07/97	196/97
Eastern Europe	The Future of Natural Gas in Eastern Europe (English)	08/92	149/92
Kazahstan	Natural Gas Investment Study, Volumes 1, 2 & 3	12/97	199/97
Kazahstan & Kyrgyzstan	Opportunities for Renewable Energy Development	11/97	16855-KAZ
Poland	Energy Sector Restructuring Program Vols. I-V (English)	01/93	153/93
Portugal	Energy Assessment (English)	04/84	4824-PO
Romania	Natural Gas Development Strategy (English)	12/96	192/96
Turkey	Energy Assessment (English)	03/83	3877-TU

MIDDLE EAST AND NORTH AFRICA (MNA)

Arab Republic of Egypt	Energy Assessment (English)	10/96	189/96
Morocco	Energy Assessment (English and French)	03/84	4157-MOR
	Status Report (English and French)	01/86	048/86
	Energy Sector Institutional Development Study (English and French)	07/95	173/95
Syria	Energy Assessment (English)	05/86	5822-SYR
	Electric Power Efficiency Study (English)	09/88	089/88
	Energy Efficiency Improvement in the Cement Sector (English)	04/89	099/89
	Energy Efficiency Improvement in the Fertilizer Sector (English)	06/90	115/90

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Tunisia	Fuel Substitution (English and French)	03/90	--
	Power Efficiency Study (English and French)	02/92	136/91
	Energy Management Strategy in the Residential and Tertiary Sectors (English)	04/92	146/92
	Renewable Energy Strategy Study, Volume I (French)	11/96	190A/96
	Renewable Energy Strategy Study, Volume II (French)	11/96	190B/96
Yemen	Energy Assessment (English)	12/84	4892-YAR
	Energy Investment Priorities (English)	02/87	6376-YAR
	Household Energy Strategy Study Phase I (English)	03/91	126/91
	LATIN AMERICA AND THE CARIBBEAN (LAC)		
LAC Regional	Regional Seminar on Electric Power System Loss Reduction in the Caribbean (English)	07/89	--
	Elimination of Lead in Gasoline in Latin America and the Caribbean (English and Spanish)	04/97	194/97
	Elimination of Lead in Gasoline in Latin America and the Caribbean Phase II - Status Report (English and Spanish)	05/97	201/98
	Harmonization of Fuels Speficifications in Latin America and the Caribbean (English and Spanish)	05/97	200/98
Bolivia	Energy Assessment (English)	04/83	4213-BO
	National Energy Plan (English)	12/87	--
	La Paz Private Power Technical Assistance (English)	11/90	111/90
	Prefeasibility Evaluation Rural Electrification and Demand Assessment (English and Spanish)	04/91	129/91
	National Energy Plan (Spanish)	08/91	131/91
	Private Power Generation and Transmission (English)	01/92	137/91
	Natural Gas Distribution: Economics and Regulation (English)	03/92	125/92
	Natural Gas Sector Policies and Issues (English and Spanish)	12/93	164/93
	Household Rural Energy Strategy (English and Spanish)	01/94	162/94
	Preparation of Capitalization of the Hydrocarbon Sector	12/96	191/96
Brazil	Energy Efficiency & Conservation: Strategic Partnership for Energy Efficiency in Brazil (English)	01/95	170/95
	Hydro and Thermal Power Sector Study	09/97	197/97
Chile	Energy Sector Review (English)	08/88	7129-CH
Colombia	Energy Strategy Paper (English)	12/86	--
	Power Sector Restructuring (English)	11/94	169/94
	Energy Efficiency Report for the Commercial and Public Sector (English)	06/96	184/96
Costa Rica	Energy Assessment (English and Spanish)	01/84	4655-CR
	Recommended Technical Assistance Projects (English)	11/84	027/84
	Forest Residues Utilization Study (English and Spanish)	02/90	108/90
Dominican Republic	Energy Assessment (English)	05/91	8234-DO
Ecuador	Energy Assessment (Spanish)	12/85	5865-EC
	Energy Strategy Phase I (Spanish)	07/88	--
	Energy Strategy (English)	04/91	--

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Ecuador	Private Minihydropower Development Study (English)	11/92	--
	Energy Pricing Subsidies and Interfuel Substitution (English)	08/94	11798-EC
	Energy Pricing, Poverty and Social Mitigation (English)	08/94	12831-EC
Guatemala	Issues and Options in the Energy Sector (English)	09/93	12160-GU
Haiti	Energy Assessment (English and French)	06/82	3672-HA
	Status Report (English and French)	08/85	041/85
	Household Energy Strategy (English and French)	12/91	143/91
Honduras	Energy Assessment (English)	08/87	6476-HO
	Petroleum Supply Management (English)	03/91	128/91
Jamaica	Energy Assessment (English)	04/85	5466-JM
	Petroleum Procurement, Refining, and Distribution Study (English)	11/86	061/86
	Energy Efficiency Building Code Phase I (English)	03/88	--
	Energy Efficiency Standards and Labels Phase I (English)	03/88	--
	Management Information System Phase I (English)	03/88	--
	Charcoal Production Project (English)	09/88	090/88
	FIDCO Sawmill Residues Utilization Study (English)	09/88	088/88
	Energy Sector Strategy and Investment Planning Study (English)	07/92	135/92
Mexico	Improved Charcoal Production Within Forest Management for the State of Veracruz (English and Spanish)	08/91	138/91
	Energy Efficiency Management Technical Assistance to the Comision Nacional para el Ahorro de Energia (CONAE) (English)	04/96	180/96
Panama	Power System Efficiency Study (English)	06/83	004/83
Paraguay	Energy Assessment (English)	10/84	5145-PA
	Recommended Technical Assistance Projects (English)	09/85	--
	Status Report (English and Spanish)	09/85	043/85
Peru	Energy Assessment (English)	01/84	4677-PE
	Status Report (English)	08/85	040/85
	Proposal for a Stove Dissemination Program in the Sierra (English and Spanish)	02/87	064/87
	Energy Strategy (English and Spanish)	12/90	--
	Study of Energy Taxation and Liberalization of the Hydrocarbons Sector (English and Spanish)	120/93	159/93
Saint Lucia	Energy Assessment (English)	09/84	5111-SLU
St. Vincent and the Grenadines	Energy Assessment (English)	09/84	5103-STV
Trinidad and Tobago	Energy Assessment (English)	12/85	5930-TR

GLOBAL

Energy End Use Efficiency: Research and Strategy (English)	11/89	--
Women and Energy--A Resource Guide The International Network: Policies and Experience (English)	04/90	--
Guidelines for Utility Customer Management and Metering (English and Spanish)	07/91	--
Assessment of Personal Computer Models for Energy Planning in Developing Countries (English)	10/91	--
Long-Term Gas Contracts Principles and Applications (English)	02/93	152/93

Region/Country	*Activity/Report Title*	*Date*	*Number*
	GLOBAL (Continuation)		
	Comparative Behavior of Firms Under Public and Private Ownership (English)	05/93	155/93
	Development of Regional Electric Power Networks (English)	10/94	--
	Roundtable on Energy Efficiency (English)	02/95	171/95
	Assessing Pollution Abatement Policies with a Case Study of Ankara (English)	11/95	177/95
	A Synopsis of the Third Annual Roundtable on Independent Power Projects: Rhetoric and Reality (English)	08/96	187/96
	Rural Energy and Development Roundtable	05/98	202/98

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