

*Initiating the Bank's Peri-Urban/Rural
And Renewable Energy Activities in Nigeria
Workshop Proceedings*

June 2005

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JOINT UNDP / WORLD BANK
ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

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Energy Sector Management Assistance Program (ESMAP)

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**Energizing Rural Transformation in Nigeria:
Scaling Up Electricity Access and Renewable Energy
Market Development**

National Workshop

Part I

WORKSHOP SYNTHESIS REPORT

1

OVERVIEW

Introduction

1.1 On March 19-20, 2001, more than 200 government officials, multi-lateral development bank representatives, international rural energy and other development experts, researchers, private sector companies and NGOs came together for the first workshop of a two-part series on rural energy in Nigeria. The workshop, entitled “Energizing Rural Transformation in Nigeria: Scaling Up Electricity Access and Renewable Energy Market Development,” was hosted by the Honorable Olusegun Agagu, Minister of Power and Steel, Government of Nigeria. Workshop codirectors were Mr. Arun Sanghvi, Africa Rural and Renewable Energy Initiative, World Bank, and Mr. John Brodman, Office of African and American Affairs, United States Department of Energy. The Nigerian Federal Ministry of Power and Steel sponsored the workshop, in cooperation with the Energy Commission of Nigeria, United States Department of Energy (DOE,) the World Bank’s Africa Rural and Renewable Energy Initiative (AFRREL,) the Energy Sector Management Assistance Program (ESMAP,) and United States Agency for International Development. Coordinating assistance was provided by the International Centre for Energy, Environment and Development (ICEED) and Winrock International, and financial sponsorship was contributed by Solar Electric Light Fund (SELF.)

Workshop Objectives

1.2 The objectives of the Workshop on Energizing Rural Energy Transformation in Nigeria were:

- Accelerate the process of formulating Nigeria’s overall vision for scaling up electricity access from renewable energy sources in underserved areas in a rapid and sustainable manner
- Identify key principles for framing the policy platform and institutional framework required for mounting a large-scale clean energy program
- Formulate a strategy for developing renewable and clean energy resources in a cost-effective manner, while supporting the twin objectives of poverty reduction and improved environmental conditions
- Initiate the process of formulating Nigeria’s strategy for rural energy provision for rural transformation, taking into account lessons learned and best practices from other key countries.

1.3 The workshop’s organizers placed great emphasis on promoting participation and dialogue across Nigeria’s energy sector. Workshop delegates were major stakeholders in the rural electrification arena. These delegates included key government officials, political and community

leaders, staff from academic institutions and think tanks, nongovernmental organizations (NGOs,) private sector firms, donor institutions, and commercial financiers.

1.4 Speakers and panelists included senior Nigerian federal, state and local government officials, international rural energy policy experts, professionals from Nigerian NGOs and universities, practitioners from several development sectors, and representatives from the World Bank and U.S. government agencies.

2

SUMMARY OF PRESENTATIONS

Day 1, Session 1: Opening Session

2.1 The opening session was chaired by Dr. E.A. Ekerendu, Permanent Secretary of the Federal Ministry of Power and Steel. Opening statements were made by the following Nigerian and international dignitaries:

- Alhaji Mohammed Danjuma Goje, Hon. Minister of State for Power and Steel,
- Dr. Olusegun Agagu, Hon. Minister for Power and Steel,
- Hon. Nnamdi Eriobuna, Chairman, Senate Committee on Power,
- Hon. Idris Abdulahi Umar, Chairman, House Committee on Power and Steel,
- Dr. Usman Bello, Permanent Secretary, Ministry of Environment,
- Hon. Howard Jeter, U.S. Ambassador to Nigeria, and
- Mark Tomlinson, World Bank Country Director for Nigeria.

2.2 Each speaker expressed strong support for improving Nigeria's electricity infrastructure and rapidly scaling up energy access and supply, in order to foster positive economic and social transformation in the country's rural areas.

2.3 The dignitaries highlighted the need to create a strategy for developing renewable and clean energy resources in a cost-effective manner, while supporting poverty reduction and a clean environment. Other issues considered important included:

- The need to serve unelectrified areas in a rapid and sustainable manner
- Framing a policy platform suitable for mounting a large-scale clean energy program
- The need to learn from the experiences of other countries
- The importance of public, private and multilateral cooperation, and
- The critical role of privatization and electric industry restructuring.

Day 1, Session 2: International Experience in Rural Electrification

2.4 The second session, chaired by Mr. Nasir Ahmed el-Rufai, Director General of the Bureau of Public Enterprises, described the experiences of other countries in initiating large-scale rural electrification programs. A brief summary of each presentation follows.

“Gearing Up for a Big-Impact Rural Electrification Program”

– *Arun Sanghvi, Lead Energy Specialist, Africa Rural and Renewable Energy Initiative (AFRREI), World Bank*

2.5 Mr. Sanghvi began his presentation with a photo of the earth at night, showing that Africa is virtually unserved by modern lighting compared to the rest of the world. He noted that electrical energy could transform rural life in many ways, including reducing rural poverty, improving health and education, and addressing other priorities. Access to modern energy can also foster increased local empowerment and a cleaner environment.

2.6 Mr. Sanghvi stressed that successful rural electrification programs in other countries, such as those in Mexico and Indonesia, have been founded on favorable macroeconomic conditions and genuine government commitment. He suggested that other success factors in large-scale rural electrification programs include (a) cost recovery for service providers, (b) the limited-term use of “smart subsidies,” (c) “working on both sides of the meter,” or providing incentives for both suppliers and end-users, (d) employing demand-driven selection criteria with an emphasis on cost recovery, (e) providing government-backed incentives to reduce costs, and (f) promoting a supportive political environment.

2.7 To illustrate the importance of policies, Mr. Sanghvi pointed out that Nigeria's per capita GNP is roughly similar to that of Vietnam. Yet more than 80 percent of Vietnamese households have access to electricity, while only about 30 percent have such access in Nigeria. Sanghvi suggested that governments shift their rural energy role from that of service provider to service enabler, and from primary financier to provider of smart subsidies. Government could also coordinate policy setting and oversee policy implementation, ensure community participation, and foster cross-sectoral links with other development sectors. These sectors may include health, education, agriculture, water, microenterprise development, and rural information and communications technologies.

“Enabling Renewable Energy Scale-Up: the Role of the State and the Case of Chile”

– *Dr. Alejandro Jadrasic, former Minister of Energy for Chile*

2.8 Dr. Jadrasic shared the experience of the Chilean Energy Ministry's program to expand the national renewable energy (RE) market rapidly and cost-effectively. In 1994, the Chilean government made RE a priority as a tool for promoting economic growth and social equity. The Energy Ministry designed a program to reach 75 percent of the population by the year 2000, emphasizing regionally decentralized decision-making, joint financing, efficient allocation of resources, and promotion of alternative technologies.

2.9 Jadrasic noted that mild regulation of natural monopolies and subsidized projects, smart subsidies, reasonably regulated tariff structures, and environmental regulations all complemented transparent market transactions and strong reliance on community participation. In stressing the role of community participation, Jadrasic noted that all rural energy project proposals in the Chilean program had to originate within the communities themselves.

The Chilean program proved very successful, achieving 76 percent coverage by the end of 1999.

In his concluding recommendations Dr. Jadrasic suggested:

- Creating market incentives to encourage private companies to solve rural electrification problems
- A management model featuring central coordination but decentralized implementation
- Close collaboration between government, the private sector, and end users.

“Increasing the Pace and Lowering the Costs of Rural Electrification Connections”

– Rob Stephen, Eskom, South Africa

2.10 Mr. Stephen presented Eskom’s experience of a large-scale rural electrification program in South Africa. The Eskom program increased the rate of connections from a few thousand per year to 300,000 per year, and costs fell by 50 percent in five years. Stephen listed a number of key elements to a successful rural electrification program:

- Clear direction from the federal government
- Clear targets and performance indicators established in advance
- Availability of adequate funds
- Realistic timetables and goals
- The involvement of all stakeholders
- A clear decision about revenue management and metering technology and systems, made at the beginning of the electrification program
- Optimized and standardized technology.

2.11 The logistical challenge in South Africa was great; on average, over the course of five years, a connection had to be made every 30 seconds, a pole had to be placed in the correct position every 10 seconds, and 200 meters of cable had to be strung every 60 seconds.

2.12 Eskom staff reviewed their plans every three months to reevaluate targets and costs, so that they could better mitigate potential risks associated with (a) sudden changes in political situations, (b) local population demographics, (c) the lack of accurate data, and (d) other difficulties meeting deadlines in remote communities.

2.13 Stephen noted that Eskom worked through “electrification committees” elected by the communities themselves, and later with the Local Authorities when they were formed. Eskom found that communities were very interested in “transfer of skills,” i.e. local construction of facilities, and local training in maintenance and operation of systems.

2.14 Stephen suggested tackling technical interventions through four avenues: (a) determining realistic load requirements of rural populations, (b) determining the supply options, (c) ensuring that equipment is used optimally; and (d) revenue management and metering.

2.15 Stephen identified the main initial obstacles to the South African program as insufficient funds and the lack of clear direction from the federal government. These were overcome by reducing costs and establishing clear objectives internally.

“Policy Platform for Scaling Up Access: Lessons from International Experience”

– Wolfgang Mostert, International Expert on Rural Electrification Policy

2.16 Mr. Mostert began by outlining four elements necessary for a successful rural electrification company:

- Access to finance
- Operational know-how
- An enabling legal and regulatory framework

- Access to market information.

2.17 In contrast to old, top-down regulatory paradigms, new regulatory models focus on bottom-up, and entrepreneur-driven competitive energy markets. This focus promotes a flourishing of ideas and local initiative. Mr. Mostert called for the “re-humanization” of regulation, in which political intervention is avoided as much as possible. Regulation should provide a supporting framework for commercial activity, not be an obstacle to it. Electrification projects should focus first on maximizing electrification coverage by building the project around the demand of “anchor customers,” and then strive for high connection rates to meet social goals and achieve economies of scale. Mostert suggested letting tariffs vary according to the local cost of supply, and narrowing differences in tariff levels by imposing charges on urban consumption to subsidize rural electrification. Finally, Mostert recommended the use of “smart subsidies” in order to increase access to rural electricity.

Day 1, Session 3: Policy and Institutional Framework for Scaling Up Electricity Access — Key Issues and Challenges

2.18 The third session, chaired by Hon. Nnamdi Eriobuna, Chairman of the Senate Committee on Power, highlighted the role of government-owned utilities and local and national governments in restructuring the electricity sector and developing rural electrification programs.

“The Role of a Restructured and Privatized Power Sector in Scaling Up Electricity Access”

– Nasir Ahmed el-Rufai, Director General, BPE

2.19 Mr. El-Rufai noted that the vertically integrated structure of Nigeria's National Electric Power Authority (NEPA) has placed significant strain on the electricity sector in that country. The NEPA holds a monopoly on generation, transmission and distribution, and both regulation and implementation are under government control. Over the years, this structure has led to inconsistencies in policy, inadequate investment in the sector, management and maintenance problems, poorly maintained facilities, inadequate consideration of environmental concerns, heavy import requirements, and unreliable electricity supply. Further, only 36 percent of the population has access to the electric grid, and the majority has access for only six hours a day. Mr. El-Rufai reported that the government plans to provide 2,500 MW of new electric generation by December 2001. However, if the government is striving to reach 80 percent of the population, it will need to increase generation to 6,000 MW immediately and to 10,000 MW and 20,000 MW by 2005 and 2010, respectively, if it is to meet the demand.

2.20 El-Rufai suggested that Nigeria needs to promote an electricity supply industry (ESI) that meets current and future demand, modernizes and expands coverage, and supports economic and social development needs. To do this, Nigeria needs an unbundled NEPA and privatized generation, distribution and retail sectors, supported by a strong market structure and clear legal and regulatory frameworks. Electricity sector reform is beginning in Nigeria, starting with a draft Power Act, which is slated for public discussion soon. Consultants have also been hired to provide advice on unbundling NEPA by 2002. A new law, to be enacted in 2001, will create an appropriate market structure and a regulatory body, and will allow private investment in the power sector.

“The Potential Role of NEPA in Grid Rural Electrification in a Restructured Distribution Sector”

– Senator Liyel Imoke, Chairman, National Electric Power Authority (NEPA) Technical Board

2.21 According to Sen. Imoke, rural electrification in Nigeria has traditionally meant installing lighting systems, thus far a financially unsustainable undertaking. The current objective of NEPA's rural electrification program, however, is to make rural electrification cost effective. The broader goals of the

rural electrification program are (a) to increase agricultural productivity through intensified irrigation and more efficient agricultural processing and crop preservation systems, (b) to promote rural enterprise, and (c) to reduce urban migration by bringing modern communications and entertainment facilities to the rural areas.

2.22 Sen. Imoke explained that NEPA's Rural Electrification (RE) subsector (within the Distribution and Marketing sector) has been in existence for 22 years, and that NEPA has much to offer in terms of engineering expertise and technical assistance for rural electrification projects nation-wide.

2.23 Under current unbundling plans, NEPA's RE subsector is being decentralized and most of its engineering staff is being sent to one of the six Distribution and Marketing zonal offices established around the country. The task of these zonal units is to connect all local government headquarters, and neighboring towns and villages, to the national grid.

2.24 Senator Imoke noted that the current government has budgeted and released more money for rural electrification than any previous administration, but most of this money is being channeled through the Federal Ministry of Power & Steel rather than NEPA. Increased funding has led to improvements in the RE program's efficiency and effectiveness, and strides have been made in achieving RE goals. So far, 600 out of 774 local government offices have been connected to the grid. The main obstacles to date include lack of adequate power supply at required locations and the need to construct thousands of kilometers of 33-kV inter-township connection line (with resultant high voltage losses, vandalism and theft) and limited access to needed off-shore materials.

“Review of the Federal Rural Electrification Program”

*Engr. H. Nggada, Director, Electrical Inspectorate Services Department,
Federal Ministry of Power & Steel*

2.25 Engr. Nggada described Nigeria's rural electrification (RE) program, which is aimed at connecting all local government headquarters and select neighboring towns and villages to the national grid. The program began in 1981, and was originally implemented by NEPA. In 1987 the federal government negotiated an agreement with Bulgaria and Germany to supply US\$75,000,000 worth of necessary imported materials, while those materials that could be produced locally – wooden crossarms, reinforced concrete poles, tie straps, stay blocks, etc. – were purchased on the local market. In 1989, the federal government inaugurated an Implementation Committee on Rural Electrification (ICRE,) composed of officials from NEPA, the Federal Ministry of Power & Steel, and the Electrical Inspectorate Services Department. RE projects are monitored by the 15 zonal offices of the Ministry, and NEPA's RE Department handles project supervision and evaluation.

2.26 Nggada noted that rural loads are small and sparsely distributed and therefore expensive. Though it cannot be justified on the grounds of economic viability, rural electrification is defended on the grounds of economic and social development and quality of life improvement for rural people. The main constraints to the national RE program have been: (a) budgetary limitations, (b) insufficient bulk power supply, (c) failure of systems due to faulty materials and vandalism, and (d) high costs associated with the distance of remote communities from the existing grid. Accordingly, the Ministry is looking into the use of solar and other renewable energy sources to provide power for rural areas. Additionally, the National Assembly is proposing a bill to mandate the licensing of retailers of high tension and other major power transmission and distribution materials, in order to curb vandalism. An estimated N45.2 billion (US\$370 million) is needed to complete all planned RE projects. Japan has recently awarded a JY1.2 billion (US\$9.6 million) grant in support of Nigeria's RE goals.

“Rural Electrification Programme Review and Future Challenges: A State Perspective”

– Engr. Ahmed K. Amshi, General Manager of Yobe State Rural Electrification Board

2.27 Engr Amshi began his presentation by noting that the Yobe State Rural Electrification Board (REB) establishes and manages the state's RE programs, and generates, transmits, distributes and sells electricity, both in bulk, and to individual customers. The REB consists of a chairperson, general manager and secretary, one representative from each local government area within the state, and representatives of NEPA, Ministry of Works, Ministry of Justice and the Governor's office. Only 25 percent of Yobe state has access to the national grid, and nine out of seventeen local government headquarters are not connected.

2.28 According to Engr. Amshi, the REB's biggest obstacles include (a) limited knowledge of electricity supply issues on the part of the chairperson and local government representatives, (b) inadequate access to the national grid, (c) insufficient access to and affordability of alternative sources of electricity, such as diesel generators and solar power systems, and (d) inadequate federal funding for states' rural electrification needs.

2.29 Yobe state is trying to cope with these obstacles in part by working with local government councils to promote rural electrification. In new projects, the state provides the local government with a generator and distribution network as well as staff to manage, operate, and maintain the station. The local government, meanwhile, provides a second generator, power station and perimeter fencing, as well as the fuel and operating materials, as well as managing customer bill collection.

2.30 Some local government councils take on rural electrification on their own, working to get communities connected to the national grid without government assistance. (There are currently four community-driven rural electrification projects.) In addition, outside funders occasionally provide funds for community projects. NEAZDP, a European Union assisted program, has funded four such projects.) According to Amshi, no rural electrification projects have been completed by the Federal Ministry in Yobe state since its creation in 1991. In 1995, the Ministry began two projects in Yobe to connect local government headquarters to the grid, but progress has been limited. A third project –a collaboration between the Ministry and the state government – is in the works, but again, it is not yet completed. Yobe plans to electrify 25 additional towns by the end of 2001, provided the Ministry widens access to the national grid within the state.

Day 2, Session 1: Accelerating Renewable Energy Market Development

2.31 The first session on Day 2, chaired by Dr. I.H. Umar, Director General, Energy Commission of Nigeria, highlighted the role of renewable energy in meeting Nigeria's rural power needs in an environmentally sound manner.

“Renewable Energy Development: Status and Prospects”

*– Professor O. C. Iloeje, Director, Energy Planning and Analysis,
– Energy Commission of Nigeria*

2.32 As a representative of the primary government agency responsible for the development and promotion of renewable energy technologies, Iloeje noted that Nigeria has significant hydropower, solar, and biomass energy resources, and a reasonable coastal wind regime. The Government of Nigeria's policy towards renewables calls for the incorporation of renewables into the country's energy supply, and

especially for their use for decentralized rural energy supply, while discouraging the use of wood as a fuel source. The Energy Commission, through the National Centre for Energy R&D and Sokoto Energy Research Centre, has developed and tested a wide range of renewable energy technologies for use within the country. The research institutes have also gathered significant renewable energy resource data, and provided science and technology training. The Energy Commission of Nigeria (ECN) itself publishes and disseminates booklets and manuals to promote renewable energy, and has established dozens of renewable energy pilot and demonstration projects. The ECN is also implementing an integrated rural village energy supply program in two communities, in order to address a range of socioeconomic needs in a sustainable manner.

2.33 To accelerate the adoption of renewable energy to meet rural needs, Iloeje recommended that government should (a) set numerical or percentage targets for renewable energy uptake, (b) provide tax relief, discounts, and other financial incentives to consumers, (c) provide duty free import and other incentives to suppliers, and (d) establish a renewable energy fund to help finance these systems.

2.34 Iloeje called on the private sector to find ways to reduce the initial price shock of renewable energy systems, and ensure after-sale service, maintenance, and management for consumers. He also recommended that consumers should be willing to pay for the cost of supported services, and should organize as communities to manage local energy systems. Finally, Iloeje highlighted the continuing need for promotion and raising awareness in order to successfully integrate renewable energy into the national energy supply mix.

“Solar PV Market Development: Barriers and Prospects”

– Tunji Ajani, Director, Solar Energy Systems & Products Co., Ltd.

2.35 Mr. [Query: “Ms?”] Ajani noted that while solar energy provides a versatile power supply that relies on local resources, institutional obstacles and subsidized conventional fuels (which are nonetheless in short supply locally) have hindered its widespread adoption in Nigeria. Ajani recommended a dual approach to overcoming these barriers -- on the one hand providing incentives like soft loans, pilot projects, and subsidies -- and on the other hand deregulating the power generating sector and eliminating or reducing import duties, to place solar energy on a level playing field with conventional energy sources.

“Climate Change and Renewable Energy Development in Nigeria”

– Alhaji Y. Tanko, Global Environment Facility (GEF) Operational Focal Point and Director, Planning Research and Statistics, Federal Ministry of Environment

2.36 Mr. Tanko highlighted the importance of pursuing development goals in an environmentally sound and sustainable manner. The global “Agenda 21” identified climate change as a major environmental concern. Mr. Tanko emphasized the need to adopt appropriate strategies, including the development of appropriate renewable energy technologies and capacity building, in order to move Nigeria and other developing countries forward in meeting the obligations identified by the Agenda. As climate change is likely to have very detrimental effects on Nigeria, that country’s current administration has identified it as one of its major environmental concerns requiring urgent attention. Nigeria was actively involved in the intergovernmental negotiations at the UN Framework Convention on Climate Change (UNFCCC), and has set in motion the process of ratifying the Kyoto Protocol. This will make Nigeria eligible to undertake projects under the Clean Development Mechanism (CDM,) and attract investment in clean technologies such as the Trans-West African Gas Pipeline and Trans-Regional Railway projects.

2.37 In July of 2000 a Nigeria and GEF Country Dialogue Workshop was organized to garner support among key stakeholders – including the Federal Ministry of Power and Steel, the Energy Commission of Nigeria, the World Bank, private sector representatives, and NGOs – for initiating renewable energy and other GEF project concepts. Nigeria's GEF-related activities will focus on the two main objectives outlined in GEF Environmental Programme 6. The first objective is removing barriers to the use of commercial or near-commercial renewable energy technologies (RETs); the second is reducing implementation costs associated with lack of practical experience, initial low volume markets, or the dispersed nature of RET applications.

2.38 The GEF operational focal point and its secretariat look forward to providing relevant assistance with promoting and implementing a strong renewable energy program in Nigeria.

“Solar Energy for Rural Development”

–Ewah Out Eleri, Director

International Centre for Energy, Environment and Development (ICEED)

2.39 Mr. Eleri noted that Nigeria is in the process of seeking assistance from the Global Environmental Facility (GEF) in completing a private sector-driven solar energy project. The overall objectives of the project are to alleviate poverty in rural areas while simultaneously reducing emissions of greenhouse gases from fossil-fuel-based electricity generation. Mr. Eleri explained that the solar energy project would improve the quality of life of rural people by making it possible to refrigerate in clinics, and providing lighting for rural secondary schools, microenterprises and residences. It will also limit reliance on petroleum for further electrification, thereby reducing greenhouse gas emissions and contributing to international efforts to stem global warming. Mr. Eleri closed by describing some specific results expected from the project, including improving the overall policy framework, reducing prices, enhancing product quality, and promoting solar energy technology in Nigeria.

“Renewable Energy Development for Women and Sustainable Livelihoods”

– Engr. Joanna Maduka, Director, Friends of the Environment

2.40 Engr. Maduka pointed out that 60 percent of the Nigerian population, the majority of whom are women, live in rural areas. Most rural energy is used for meeting household needs, such as cooking and boiling water. Sixty to eighty percent of these needs are met by using wood and other biomass fuels. Women are the primary managers of this energy use, spending many hours each day procuring and using fuel and clean water for their family's benefit. Women are primarily responsible for many other energy-intensive activities, such as agricultural production and processing. Further, women are often the first victims of fuel shortages and energy price hikes, energy-related accidents and injury, and environmental degradation associated with unhealthy and unsustainable energy generation and use. Though women are key stakeholders in rural energy, their role in the development, implementation and evaluation of rural energy projects is largely overlooked, and the energy needs associated with women's responsibilities – including domestic, income-generating and community related activities – go largely unnoticed.

2.41 There is a need to focus rural energy programs on meeting women's basic energy needs – needs which benefit rural families and meet development objectives – as well as the needs associated with women's ability to increase their income-earning potential in order to benefit the family and to advance women's economic empowerment. Further, not only is there a need to increase women's involvement in the planning, implementation and evaluation of rural energy programs, but there is also a need to

reevaluate whether the kinds of renewable energy technologies being developed are designed to benefit both women and men. This will require (a) a dramatic increase in women's participation in the design and deployment of rural energy programs, (b) capacity-building among rural women in the design, construction, installation, maintenance and operation of the energy technologies that are being deployed, (c) promoting women's increased involvement in both basic education and higher scientific and technical education and training programs, (d) increased access by women to credit, and (e) policies at the national, local and institutional levels that support these priorities.

Day 2, Session 2: Energy as a Catalyst for Rural Transformation

2.42 The second session, chaired by Hon. Idris Abdulahi Umar, Chairman of the House Committee on Power, highlighted the importance of modern energy supply in meeting broader rural development needs beyond household lighting.

“A Demand-Driven Framework for Linking Energy and Key End-Use Sectors”

– Jamal Gore, Africa Program Manager, Winrock International

2.43 Mr. Gore noted that energy, and especially electricity is not valued in itself; rather it enables other valuable activities. Gore said that an emphasis on productive (income generating and labor saving) energy applications – as opposed to focusing only on household electrification – could help increase willingness and ability to pay for connections. Also, to ensure that programs are actually useful, planners must recognize that the energy (and electricity) needs of men and women may differ, and this issue must be addressed appropriately in advance. Gore described his organization's work in applying participatory approaches to determine income generating and labor saving energy needs in rural communities. However, Gore also noted that energy inputs alone are not sufficient to solve many social and economic problems. Project teams must address cross-sectoral needs, including the need for market access and for technical and financing assistance.

“The Role of Household Energy in Rural Transformation”

– Joe Obueh, Director, Centre for Household Energy and the Environment (CEHEEN)

2.44 Mr. Obueh noted that household energy helps create income generating opportunities, basic rural infrastructure, environmental resource management, and opportunities for social improvement. All of these needs are not merely components of economic development, but of broader rural development. To continue meeting the basic needs of resource-poor people, Obueh recommended that stakeholders, agencies, and local and international organizations take the following steps: (a) include intermediate household energy in national and local energy planning; (b) remove distorting taxes on household fuels; (c) help government to encourage private sector participation in household energy service and delivery; and (c) promote the viability of small scale enterprises using renewable energy.

Day 2, Session 3: Closing Session: Key Next Steps for Moving Rapidly to a Big-Impact Programme for Scale-Up and Rural Transformation

2.45 The final session was chaired by Dr. E.A. Ekerendu, Permanent Secretary, Federal Ministry of Power and Steel. John Brodman of DOE/USAID and Arun Sanghvi of the World Bank made closing statements. Sanghvi called for all sponsors and participants to make a commitment to the main objectives of the workshop, namely: to begin formulating a statement of principles from key stakeholders and decision-makers, and to clearly articulate the next steps to be made in support of a national rural energy development program for Nigeria.

2.46 Other closing speakers highlighted the need for cooperation across organizations and institutions, the need to maintain active government involvement in rural electrification, and the need to involve other federal and state ministries in these programs. Specifically, the closing speakers called for (a) the development of a Rural Electrification Strategy paper, including suggestions for coordination between federal and state governments, and coordination of rural electrification policy and implementation approaches, (b) definition of terms of reference (TOR) and a mobilization plan for a national Rural Electrification Agency, and (c) definition of the scale and scope of a National Rural Renewable Energy Program, including key principles for implementing the program, targets for each component, key cross-sectoral links, and potential financing mechanisms.

2.47 A follow-up renewable energy conference is planned for July 2001. At this conference, project-specific renewable energy opportunities for Nigeria will be discussed, as well as implementation strategies. Overall findings for various renewable energy technology sectors will be highlighted, and a renewable energy strategy for Nigeria will be finalized.

3

QUESTION AND COMMENT SESSIONS

3.1 Key issues raised and discussed at length during the workshop's lively question and comment sessions included:

- Sovereign Control – The development of energy projects within a Nigerian context, not dictated by foreign models. Local production and use of materials.
- Meeting Development Needs – The need to promote increased electrification while at the same time meeting poverty alleviation goals, given consumers' limited ability to pay for electricity.
- Community Participation – Local cultural considerations and contexts are very important. Not understanding and addressing these concerns can create significant barriers to rural energy deployment.
- Women and Energy – Discussion of the important role of women in energy projects was largely absent from the most of the presentations. Women are the primary managers and users of rural energy, and their participation in the development, implementation and evaluation of rural energy projects is critical. In many cases, community women have been the primary promoters of rural electricity projects.
- Environmental Pollution – The significant adverse environmental consequences of conventional electric generation went largely unmentioned in most of the presentations. Increased use of fossil fuels would have serious impacts on pollution and health. Renewable energy is a way to meet energy needs while addressing environmental concerns.
- Unbundling and Privatization – Separating utilities and other energy providers from the government is of critical importance. However, that separation may be difficult to accomplish on a practical level. The World Bank is currently engaged in a dialogue with the Nigerian government and private stakeholders, and is supporting existing NEPA energy projects, as well as NEPA unbundling.
- Decentralization – Participants called for decentralization, to help increase civil society's control of energy decisions. As one delegate noted, "If we wait for the federal government to extend the national grid to every village, we'll be waiting forever." Participants pointed out the need for the federal government to take this issue more seriously, but called on rural communities to identify their own needs and take rural electrification into their own hands in the meantime.
- Tariffs and Subsidies – Is imposing different rates for urban and rural areas necessary? Is it fair? It was argued that in Chile, charging higher tariffs to rural dwellers worked well, since this amount was still less than what rural populations were otherwise paying for generators,

kerosene, etc., and since they received significant benefits from increased access to electricity.

- Vandalism – Vandalism is a big barrier to effective rural energy deployment, and must be actively addressed.

4

COMMON THEMES

4.1 An idea that recurred in many of the presentations was that artificial price controls on conventional fuel and electricity supply have had a negative influence on the development of rural energy supply and on Nigeria's rural development in general. Heavily subsidized electricity tariffs primarily benefit urban consumers, while depriving electricity suppliers of the revenue needed to provide reliable power and the infrastructure for grid extension to the rural poor. One energy expert in attendance estimated that subsidies and inefficiency cause the Nigerian Electric Power Authority (NEPA) to lose money on every additional electrical grid connection, even as the reliability of the national grid supply is declining.

4.2 Differential price controls on petrol, diesel, and kerosene lead to the diversion of fuel to the black market, and also lead to fuel adulteration. Small businesses that depend upon a reliable fuel supply to power diesel or petrol generators are thus placed at an economic disadvantage. What is more, these low fossil fuel prices make it difficult for private solar energy companies to compete on a level playing field in rural areas, especially in the face of import duties on photovoltaics (PV) system components.

4.3 These policies also ignore the broader needs for household energy and income generation in rural Nigerian communities, and the differing needs of women and men. As a result, the vast majority of rural families use biomass fuel to meet most of their household energy needs, with high economic and labor costs, especially for women.

4.4 Many people argue that price subsidies are required because the extreme poverty of many Nigerians makes it impossible for them to pay market prices for energy. However, poorly targeted price controls and fuel subsidies can do more harm than good. By lowering prices, these controls reflect an acknowledgment that many people in rural communities are very poor. But because they fail to provide incentives to increase service, these controls do little to help people rise out of poverty.

4.5 Other approaches may better encourage rural service delivery while better targeting subsidies on those communities in greatest need. In South Africa the government gave Eskom numerical targets for rural grid electrification, and then provided a tax subsidy that helped the utility cover its costs while providing service to poor households. A similar approach is being developed for off-grid electrification there. In Chile the government encouraged poor communities to organize themselves to request service, and then provided a subsidy to encourage power providers to service those communities. By encouraging competition in Chile, and economies of scale in South Africa, these "smart subsidy" policies have helped to dramatically reduce the cost-per-connection of rural electrification service delivery in those countries.

4.6 Allowing the private sector to provide rural electrification services does not eliminate the important role of government. Government places a high priority on meeting the needs of its citizens, and has long taken an active interest in the cost and quality of the energy supply. Furthermore, government agencies have taken the lead in researching and promoting the use of new and renewable energy technologies in Nigeria. An aggressive electrification program led by the private sector makes these activities more important than ever. Indeed, the combination of limited ability to pay for service, limited information, long distances and high infrastructure costs make it difficult for private companies to operate successfully without government assistance. Instead of directly providing service, however, the government can use its resources, information, and authority to encourage private actors to put their own money at risk to achieve national objectives.

4.7 However, the private sector is unlikely to enter the rural electrification arena in Nigeria without a predictable operating environment. At minimum, regulatory and approval processes must be transparent and consistent. Pricing and subsidy policies must also be predictable and sufficient to allow a return on their investment, and the macroeconomic climate must allow long-term financing. A new Rural Electrification Agency, therefore, can serve in a number of ways. This agency can develop a consistent regulatory framework in partnership with the Ministry and NEPA, and invite companies and organizations to become service providers. It can negotiate terms of reference and performance targets in partnership with the companies, screen the companies, and provide quality control services on behalf of the Ministry. It can also provide outreach and education to participating communities, organize training and networking activities to strengthen rural service infrastructure, and monitor the application of subsidies and operation of the companies.

5

CONCLUSION

5.1 While opinions varied, participants and delegates largely encouraged a common set of principles to guide the evolution of Nigeria's rural energy sector.

5.2 Given NEPA's current supply difficulties, participants and delegates agreed that the cornerstones of a large-impact, sustainable program should be *demand-driven, private sector-led, and commercially-oriented rural electrification*. Of course, in any initiative led by the private sector, care must be taken to ensure that societal needs are met. Furthermore, rural transformation requires that the energy sector develop cross-sectoral links with other social sectors (e.g., agriculture, health and education,) as well as investment sectors (e.g., supporting small and medium enterprises in need of energy inputs and helping provide water and telecommunications services to develop rural infrastructure.

5.3 *Policies and institutions must be responsive to changing needs.* Mounting a major rural energy delivery program will require, among other things, the following:

- An unprecedented degree of policymaking and oversight coordination between federal, state, and local governments in order to maximize development impact per Naria invested
- Increased engagement and participation by communities and other stakeholders, to ensure that rural electrification sub-projects are demand-driven and sustainable
- Attracting the private sector and commercial finance institutions as major players in the program
- The evolution of federal and state governmental institutions from *providers* of service to *enablers* of service, and from being the primary financiers of rural electrification to being providers of "smart" subsidies, complementing commercial finance, to meet social goals and promote rapid scale-up while providing strong incentives to reduce costs-per-connection
- Significantly expanding the range of supply options, renewable energy technologies and sources, and delivery mechanisms in order to increase end-user choices while lowering the cost of connection and supply.

5.4 In support of this lattermost objective, the U.S. Department of Energy, the World Bank, and the Ministry of Power and Steel agreed in principle to organize a follow-up workshop on renewable energy. Ideally, this event would be jointly sponsored with one or more of the other stakeholder federal ministries (for example, the Ministry of Agriculture and Rural Development, or the Ministry of Communications.)

Annex1

WORKSHOP AGENDA

DAY 1: Monday, March 19, 2001

Session 1 Opening Session

Chair: Dr. E.A. Ekerendu, Permanent Secretary, Federal Ministry of Power and Steel

08:30 – 09:30 Registration and arrival of participants

09:30 – 09:35 National Anthem

09:35 – 09:45 Welcome remarks by *Hon. Dr. Olusegun Agagu, Minister of State for Power and Steel*

09:45 – 09:55 Keynote address by *Hon. Alhaji Mohammed Danjuma Goje, Minister of Power and Steel*

09:55 – 10:05 Address by *Hon. Nnamdi Eriobuna, Chairman, Senate Committee on Power*

10:05 – 10:15 Address by *Hon. Idris Abdulahi Umar, Chairman, House Committee on Power and Steel*

10:15 – 10:25 Address by *PS Ministry of Agriculture and Rural Development*

10:25 – 10:35 Address by *PS Ministry of Environment*

10:35 – 10:45 Address by *Hon. Ambassador Howard Jeter, US Ambassador to Nigeria*

10:45 – 10:55 Address by *Mark Tomlinson, World Bank Country Director for Nigeria*

10:55 – 11:35 Tea-Coffee Break

Session 2 International Experience in Rural Electrification

Chair: Mr. Nasir Ahmed el-Rufai, Director General, BPE

11:35 – 11:55 Gearing Up for a Big-Impact Rural Electrification Program, *Mr. Arun Sanghvi, Lead Energy Specialist, World Bank*

11:55 – 12:15 Enabling RE Scale-Up – Role of the State, the Case of Chile, *Dr. Alejandro Jadrasic, ex-Minister of Energy, Chile*

12:15 – 12:35 Increasing the Pace and Lowering the Costs of Rural Electrification Connections, *Rob Stephen, ESKOM, South Africa*

12:35 – 12:55 Policy Platform for Scaling Up Access – Lessons from International Experience, *Wolfgang Mostert, International Expert on Rural Electrification Policy*

12:55 – 13:55 Panel Discussion

13:55 – 15:00 Lunch

Session 3 *Policy and Institutional Framework for Scaling Up Electricity Access – Key Issues & Challenges*

Chair: Hon. Nnamdi Eriobuna, Chairman, Senate Committee on Power

15:00 – 15:20 Role of a Restructured and Privatized Power Sector in Scaling Up Electricity Access, *Mr. Nasir Ahmed el-Rufai, Director General BPE*

15:20 – 15:40 The Potential Role of NEPA in Grid Rural Electrification in a Restructured Distribution Sector, *Senator Liyel Imoke, Chairman Technical Board NEPA*

15:40 – 16:00 Review of Federal Rural Electrification Program, *Engr. H. Nggada, Director of Electrical Inspectorate Service, Federal Ministry of Power and Steel*

16:00 – 16:20 Rural Electrification Programme Review and Future Challenges – A State Perspective, *General Manager, Yobe State Rural Electrification Board*

16:20 – 17:30 General Discussion

18:00 – 20:00 Reception and Dinner

DAY 2: Tuesday, March 20, 2001

Session 1 *Accelerating Renewable Energy Market Development*

Chair: Dr. I.H. Umar Director General, Energy Commission of Nigeria

09:00 – 09:20 Renewable Energy Development – Status & Prospects, *Prof O.C. Iloeje, Director, Energy Commission of Nigeria*

09:20 – 09:40 Solar PV Market Development, Barriers and Prospects, *Tunji Ajani, Director, Solar Energy Systems & Products Co.*

09:40 – 10:00 Climate Change & Renewable Energy Development in Nigeria (*Global Environment Facility Focal Point, Federal Ministry of Environment*)

10:00 – 10:20 Solar Energy for Rural Development, *Ewah Otu Eleri, Director, International Center for Energy, Environment and Development (ICEED)*

10:20 – 10:40 Renewable Energy Development for Women and Sustainable Livelihoods, *Joanna Maduka, Friends of the Environment*

10:40 – 11:00 General Discussion

11:00 – 11:30 Tea-Coffee

Session 2 *Energy as a Catalyst for Rural Transformation*

Chair: Hon. Idris Abdulahi Umar, Chairman, House Committee on Power

11:30 – 11:50 A Demand-Driven Framework for Linking Energy and Key End-Use Sectors, *Jamal Gore, Africa Programme Manager, Winrock International*

- 11:50 – 12:10 Energizing Agricultural Development, *Ministry of Agriculture and Rural Development*
- 12:10 – 12:30 Energy for Electronic Communications, *Ministry of Communications*
- 12:30 – 12:50 Role of Household Energy in Rural Transformation, *Joe Obueh, Director, Centre for Household Energy and Environment (CEHEEN)*
- 12:50 – 13:20 Panel Discussion Comprising Above Speakers and Others TBD
- 13:20 – 14:00 Questions and Comments From Audience
- 14:00 – 15:00 Lunch

Closing Session 3 Key Next Steps for Moving Rapidly to a Big-Impact Programme for Scale-Up and Rural Transformation

Chair: Dr. E.A. Ekerendu, Permanent Secretary, Federal Ministry of Power and Steel

Concluding Remarks from:

- 15:00 – 15:10 Energy Commission of Nigeria
- 15:10 – 15:20 Federal Ministry of Environment and GEF Focal Point
- 15:20 – 15:30 Federal Ministry of Agriculture and Rural Development
- 15:30 – 15:40 Federal Ministry of Finance
- 15:40 – 15:50 U.S. Department of Energy
- 15:50 – 16:00 World Bank
- 16:00 – 16:15 Federal Ministry of Power and Steel
- 16:15 Adjournment

Annex2

Annotated List of Renewable Energy Companies, NGOs and Public Agencies

S/NO	Company	Field of Activities	Address	Telephone	Fax
1	A.O. Demarg Nig. Ltd	PV consultancy, retailing, equipment supplies, installation, services	50 Woji Housing Estate, P.O. Box 70, Woji Port Harcourt, Rivers State	084-231944	084-231944
2	Accord for Community Development	Rural development, environment, energy, capacity-building	1 Evergreen Close Ogbonda Estate (Off Artillery) Rumuogba	084-571503	
3	ACUTECS Nig. Ltd.	PV Retailing, equipment supplies, installation, services	5 Sura Mogaji Str. (off Coker Rd.) Ilupeju, P.O. Box 9263	01-963886	
4	ADVANTEC Int. Nig. Ltd.	PV Retailing, equipment supplies, installation, services	5B Agodogba Av. Park View Estate Ikoyi, Lagos	01-2694440	
5	Afrobasik Nig. Ltd	PV consultancy, retailing, equipment supplies, installation, services	6 Fatomi Crescent, Bajulaye Compound, Shomolu, P.O.Box4916 Shomolu Lagos	01-823931 090-803589	
6	Alka Technical Ltd	PV Retailing, equipment supplies, installation, services	Old Jos P.O. Box 662 Bauchi	077-551174	
7	AP Sunlite Ltd	PV manufacturing, equipment supplies, retailing, installation, services	AP Apapa Complex PMB 1036, Abuja	09-5872512	09-587 0426
8	Atlantic Solar Product Inc.	PV consultancy, retailing, equipment supplies, installation, services	24A Cameron Rd. off Kingsway Rd. Ikoyi Lagos	01-686960	

9	Basiri Multipurpose Co-operative Union	Biogas, appropriate technology, community-level services	8 Otutubiosun Street Akure, Ondo State		
10	Belmont Ltd.	PV Retailing, equipment supplies, installation, services	1 & 2 Zaria Rd. Shargari Low Cost Barnawa, P.O.Box3264, Kaduna.	062-253128	062-231411
11	Bio-Rad Nig. Ltd	PV Retailing, equipment supplies, installation, services	11 Oseni Close (Off Modupe Johnson) Surulere Lagos.	01-7744369	
12	Bureau for Public Enterprises	Energy, electrification, reform, privatisation	Maitama District, Abuja	09-4134636-46	
13	Community Level Environmental Action Network	Community-level energy and environment services	65 Zik Avenue Uwani Enugu		
14	Drought and Desertification Control Action Team (DD-CAT)	Renewable energy, D&D control, community services	A Close, House 7 Asokoro (Off Jimmy Carter Street) Abuja		
15	Eauxwell Nig. Ltd	PV consultancy, retailing, equipment supplies, installation, services	Plot 123 Joel Ogunaike Str. GRA Ikeja Lagos.	01-4976869	01-4976059
16	Energy Commission of Nigeria	Energy, renewable, rural energy policy making	Central Business District, Abuja	09-523 4920-4	
17	Even – Ezra Nig. Ltd	PV Retailing, equipment supplies, installation, services	1 Yeshayahu Lasode Crescent, Maroko V/I, (off Lekki Epe Expressway) Lagos, P.O.Box51385, Falomo, Lagos.	01-2611927 01-611916	01-2614608
18	Federal Ministry of Power	Energy, renewable, rural energy	Shehu Shagari Way, Central	09-523	

	and Steel	policy making	Business District, Abuja		
19	Fezzan Nig. Ltd	PV consultancy, retailing, equipment supplies, installation, services	25 Sir Kashim Ibrahim Av. Borno State.	01-5880995 (Lagos No.)	
20	Friends of the Environment	Energy, environment, gender, research, consultancy	106/110 Lewis Street P.O.Box 10627 Lagos		
21	Grass-roots Resource Development Initiative	Community-based organization, development, environment	124A Okigwe Road Owerri		
22	Guisiano Nig. Ltd	PV Retailing, equipment supplies, installation, services	1 Ani-Ahbia Street Asaba Delta	056-280223	
23	Hillrich Ltd.	PV Retailing, equipment supplies, installation, services	Great Nig. House (15 th Floor) 47/57 Martins Str. Lagos	01-2660397	01-2660397
24	Hydroflow Ltd	PV Retailing, equipment supplies, installation, services	27A Rabah Road Malali GRA Kaduna.	062-238947	062-238947
25	Hyro Construction Engineering Co. Ltd	PV Retailing, engineering services, equipment supplies, installation, services	Samaru Road (Before Kano Rd. Junction) Samaru Zaria Kaduna.	069-34482	
26	ICEED – International Centre for Energy, Environment & Development	Energy, environment, water, policy research, reform, capacity-building, monitoring, evaluation	Plot 523 Misau Street Garki Abuja	09-2343836	09-2347181
27	Itado Women Multipurpose Co-op. Society	Community-based organization, gender, development, environment	8 Otubiosun Street (Off Arakade Road) Akure Ondo State		

28	Jofos Industries Ltd.	PV Retailing, equipment supplies, installation, services	2 Ali Akilu Road (Near SCOA) Kaduna.	062-233881	062-233881 062-235048
29	Maclewis Engineering Services Ltd	Renewable energy consulting, engineering services	Suit 19 Kigoma Street Wuse Zone 7, Abuja FCT		
30	National Association of Science and Technologies (NASTES)	Renewable energy science network, NGO	Oyewo's Residence Community High School Junction P. O. Box 20 Igbaye Osun State		
31	National Centre for Energy Research & D	Solar PV, thermal, research and development, outreach projects	University of Nigeria Nsukka	042-771853	042771855
32	National Electric Power Authority	Renewable, rural electrification programme implementation	Maitama District, Abuja	09-413 5614	
33	NESDEN	Environment, energy, community services	1 Evergreen Close Ogbonda Estate (Off Artillery) Rumuogba P. O. Box 14244 Port-Harcourt		
34	Ojokoro Ifelodun CAMS Ltd	Rural cooperative, energy, environment	Gengeto Bus Stop Oko-Oba Agege Lagos		
35	Philips Project Centre Ltd.	Engineering services, PV consulting, retailing, equipment supplies, installation, services	8 Kofo Abayomi Str. V/I Lagos	01-2620811 01-2620632	01-2620631 01-2615143
36	Raitas Ltd.	PV Retailing, equipment supplies, installation, services	10, Oladeinde Str. Anthony Village, (off Ikorodu Rd. Lagos.	01-4937494	01-4937494

37	RDC Power Systems Division of Renaissance Design and Construction Ltd	PV consulting, equipment supplies, installation, services	39 Commercial Avenue, P.O.Box 404, Yaba Lagos	01-866709 01-867091	
38	Resources and Food Security Foundation (REFSEF)	Community-level capacity building, agriculture, energy, environment	15 Ibikunle Avenue(Off Bodija Avenue)P. O. Box 9984 University P. O. Ibadan		
39	Rural Development Research Organization	Rural development research	99 Ogurugu Road Odenigbo Nsukka Enugu State		
40	Shereena Agricultural Ltd	Equipment supplies, installation, services	16 Magajin Ramfa Rd. P.O. Box 5283 Kano	064-631103	064-647684
41	Siemens Ltd.	PV manufacturing, design, consultancy, supplies, installation	Siemens House 98/100 Oshodi- Apapa Expressway, P.O.Box 304, Apapa, Lagos	01-4523010	01-4522259
42	Sokoto Energy Research Centre	Solar PV, thermal, research and development, outreach projects	Usman Dan fodiyo University Sokoto	060-235120	060-237568
43	Solar and Wind Technologies Ltd (Sirmawax Solar Energy Systems)	PV and wind consulting, design, supplies and installation	11 Bode Thomas Str. Surulere, Lagos	01-836556 01-5451821	01-5876854
44	Solar Electric Systems	PV consulting, equipment supplies, installation, services	6 th Floor Joseph Gonwalk House, P.O. Box 667 Jos, Plateau State.	073-450102	073-450102
45	Solar Energy Advanced Power Systems	PV consulting, hybrid power, equipment supplies, installation, services	Shamrock House, Plot 10 Apapa-Oshodi Expressway,Tincan Island, P.O.	01-5450046 01-5875200	01-5871599 Tele Fax

			Box2571 Apapa Lagos.		
46	Solar Energy Society of Nigeria	Solar energy science network	c/o Energy Commission of Nigeria Plot 701 C Central Area PMB 358, Area 10 Garki Abuja		
47	Solar Energy system and Product Co	PV consulting, equipment supplies, installation, remote power projects, services	256 Ikorodu Rd., Obanikoro, P.O. Box 622 Surulere Lagos	01-4973570	01-4973643
48	Solar Energy Tech. Nig Ltd.	PV consulting, equipment supplies, installation, services	24/26 Macarthy Str., Onikan Lagos	01-2637119	01-2637080
49	Solarium Ltd.	PV Retailing, equipment supplies, installation, services	10 Balarabe Musa Crescent, Victoria Island, Lagos	01-2624357 01-2619424	01-2626830
50	Solarius (A Branch of BOP Technologies Co.)	PV Retailing, equipment supplies, installation, services	20A McNeil Rd. Sabo, Yaba Lagos.	01-7742826	
51	Solarmate Engineering Ltd	PV consulting, equipment supplies, installation, services	34 Akinwumi Str. Alagomeji P.O. Box 1654 Yaba Lagos	01-867836 01-7740887	01-525855
52	Solarquip Nigeria. Ltd.	PV consulting, equipment supplies, installation, services	7 Sule Road P.O. Box 8458 Kaduna.	062-240618	062-230350
53	Sollatek Nig. Ltd. Solar Energy Systems.	PV Retailing, equipment supplies, installation, services	Jagal Road Oregon P.O.Box 3959 Ikeja, Lagos.	01-4961510 01-4973390-4	
54	Soltec Energy and Environmental Network	Solar energy, environment, NGO	2 Wogu Street D/Line Port-Harcourt		

55	Stephenson Brothers Ltd. (Distributor of KACO Solar Power Energy)	PV Retailing, equipment supplies, installation, services	60 Federal Palace Hotel V/I, P.M.B. 12592, Marina Lagos.	01-611048	01-619080
56	Stop Erosion Now (SEN)	Erosion control, forest management, energy, NGO	Suite 3 Fahana Business complex (Behind AP Plaza) Wuse II Abuja	09-314 3133	
57	STRUCTEC	PV Retailing, engineering, equipment supplies, installation, services	CFAO Nig. Plc, Apapa Oshodi Expressway Lagos.		
58	Sunray Electric Co. Ltd	PV consulting, equipment supplies, installation, services	8 th Floor NNDC Bidg. 18/19 Ahmadu Bello Way P.O.Box 2718, Kaduna.	062-21011 062-216645 062-214566	062-216645
59	Tenitek Nig. Ltd	PV Retailing, equipment supplies, installation, services	2 Payne Crescent P.O. Box 676 Apapa Lagos.	01-5872160	01-5877231
60	Umuodu Community Association	Rural development, electrification, community based organisation	c/o SEDI Box 3205 Enugu		
61	Unique Power Supply Engineering Service Ltd	PV Retailing, engineering, equipment supplies, installation, services	SS 23 Audu Bako Way P.O.Box 11343, Kano.	064-642719	
62	Western Sahara Environmental Society	Environment, energy, community services	5 ATC Road Katsina <u>Also</u> AP 32 Fatika Road Kaduna		

Creating Demand and Removing Barriers to Renewable Energy Market Development in Nigeria

Part II

1

INTRODUCTION

1.1 The Energy Commission of Nigeria (ECN,) in collaboration with the United States Agency for International Development (USAID,) United States Department of Energy (USDOE,) the World Bank, the United Nations Development Programme (UNDP,) the African Development Bank (ADB,) the Government of Norway, and Shell Petroleum Development Company (SPDC) hosted a national workshop on “Creating Demand and Removing Barriers to Renewable Energy Market Development in Nigeria” on November 13 - 17, 2001 at the Abuja Sheraton Hotels and Towers.

1.2 The overall objective of the workshop was to examine approaches to expanding the use of renewable energy technologies through identifying barriers to renewable energy market development, and to offer strategies for removing these barriers. Specific objectives included:

- To assist in developing renewable energy strategies in Nigeria
- To examine existing barriers to growth of demand and commercial deployment of renewable energy technologies in Nigeria
- To develop policy initiatives and programs for increasing renewable energy-based power supplies to rural sectors
- To explore opportunities for building financial mechanisms to support the growth of the renewable energy industry
- To explore the potential role of public-private partnerships in creating a viable renewable energy market
- To design renewable energy-based power supply projects for support by international aid agencies, especially the Global Environment Facility.

1.3 A total of 189 participants attended the workshop. Participants were drawn from academia, international donor agencies, the organized private sector, public service, and other relevant stakeholders.

2

OPENING CEREMONY

2.1 Opening: the Honourable Minister of Power and Steel, Chief Olusegun Agagu, declared the workshop open.

2.2 **Welcome Address:** The Welcome address was delivered by the Director General of the Energy Commission of Nigeria (ECN,) Professor I.H. Omar. Professor Omar provided the background for the workshop and explained the necessity for Nigeria to embrace renewable energy as a viable option in meeting its energy demands. He also highlighted efforts being made by the ECN to promote renewable energy technologies in Nigeria and emphasized the need to identify barriers to renewable energy development and strategies to remove these barriers, as a first step in greater market penetration of renewable energy technologies. He expressed his appreciation to the collaborators of the workshop and called upon participants to address the objectives of the workshop. He especially asked participants to explore and develop some implementable rural solar projects for Nigeria.

2.3 In his welcoming remarks, USAID Director, Mr. Thomas Hobgood commended the efforts of the organizers of the workshop and mentioned that the workshop was part of a series of planned events being arranged to develop infrastructural facilities aimed at enhancing the living conditions of Nigerians. He also mentioned that the workshop was designed to build on an earlier workshop held in May 2001 titled “Energizing Rural Transformation in Nigeria: Scaling up Electricity Access and Renewable Energy Market Development.” He enumerated efforts being put in place to improve electricity supply in the country and mentioned that in spite of these efforts; nearly 70 percent of the rural population did not have access to reliable power supplies. He then reiterated his support for the goals of the workshop and expressed his confidence that deliberations at the workshop would help Nigeria create conditions that will attract private capital investment for the creation of a highly successful indigenous renewable energy industry.

2.4 **Keynote Address:** In his keynote address on the theme “*Focusing on Renewable Energy Sources in Nigeria’s Development Strategy*,” Professor A.T. Suleiman said that the key to Nigeria’s effective and sustained technological development lies in its ability to systematically harness its enormous renewable energy resources. He defined the concept and types of energy, listed Nigeria’s energy resources, and mentioned advantages inherent in the use of renewable energy technologies. He also identified problems associated with the popularization, commercialization and marketing of renewable energy, among which are resistance to change, lack of and inadequate information base, lack of investment capital, insufficient manpower, and absence of a program of action for renewable energy. In order to remove the identified barriers, he recommended measures including public enlightenment campaigns, active involvement of the organized private sector, and developing a comprehensive national programme for integrating renewable energy technology in the nation’s energy mix. Other suggested measures include the need for government aid agencies and NGOs to meet initial RE demand by

sponsoring an application project. Furthermore, marketers of RE systems should appreciate the importance of cost-saving measures, in order to enhance the acceptability of these measures. Professor Suleiman concluded by expressing his hope that the workshop will contribute greatly to the widespread use of RE technologies.

2.5 **Goodwill Messages:** The workshop's collaborators sent goodwill messages. Mr. T. Obadaiah delivered a goodwill message from the World Bank on behalf of Mark Tomlinson. In this message the World Bank reiterated its support for the government's current drive to use reliable, cost-effective renewable energy to improve quality of life and support economic development, especially for the more than 80 percent of the country's population living in rural areas. Mr. Obadaiah appreciated the existence of barriers to achieving this goal and expressed his confidence that the workshop would adequately address strategies to overcome these barriers. He also stated his belief that renewables should not and would not completely replace other conventional forms of energy, but that they would grow to become conventional, rather than alternative energy sources. He pledged the Bank's commitment to support this goal through the Global Environment Facility (GEF) and the Prototype Carbon Fund (PCF.) In conclusion, he called on Nigeria to tap the Bank's experience in this field.

2.6 Professor E. Oladipo presented the goodwill message from the UNDP on behalf of UNDP Resident Representative Prof. Mbaya Kankwenda. The message pledged the UNDP's continued support at the national level for promoting renewable, clean rural energy in order to sustain development and build capacity. UNDP also pledged support for information sharing on new financing mechanisms to support investment in sustainable energy. Most important, UNDP would also strengthen national policy frameworks to support energy services for poverty reduction and sustainable development. In conclusion, Prof. Oladipo gave assurances of the UNDP's commitment to collaborating with stakeholders in removing barriers to the widespread application of renewable energy technologies in Nigeria.

2.7 The address by the ADB Resident Representative, Mr. J.R. Mwaikinda, emphasized that renewable energy technology has to be cheap or affordable, simple, and durable if it is to be of benefit to rural dwellers. He expressed his happiness that the workshop would focus on these issues. He also mentioned that the workshop fitted into the ADB's overarching objective of alleviating poverty in its regional member countries. He saw the adoption of renewable energy technology as a means of reducing global warming and highlighted the benefits of embracing and popularizing this technology. He finally described some of the ADB's work to encourage the use of renewable energy in some member countries.

2.8 In his message, the Norwegian Ambassador, Mr. Dag Nissen, explained that access to energy is fundamental to development and poverty reduction. He regretted that this is often an overlooked theme in the development debate despite the fact that all major challenges in development cooperation are, in one way or another, associated with energy. He pledged the commitment of the Government of Norway to intensifying efforts in the field of energy, development, and the environment in the coming years. He promised that the government of Norway would ensure that energy and environmental issues occupy a central place on the agenda for the World Summit on Sustainable Development in September, 2002 in South Africa. He assured the participants that the report and outcome of the workshop would be of interest to those in Norway who are involved in renewable energy. He recalled Nigeria's important role in the "New Partnership for Africa's Development," and hoped that the workshop's report would be an important contribution to the partnership and to the World Summit on Sustainable Development.

3

PRESS CONFERENCE

3.1 Professor I.H. Umar, Director General of the Energy Commission of Nigeria, addressed a press conference after the opening ceremony. Professor Umar expressed appreciation for the enthusiasm shown by members of the press in promoting the use of renewable energy technologies to alleviate the energy supply stresses being witnessed by Nigerians, especially the rural populace. He also informed them about the domestication of some renewable energy technologies by the Commission's two renewable energy research centers. He highlighted a few of the pilot renewable energy schemes currently operating in different parts of the country. Mention was made of the complementary efforts by some donor agencies, e.g. the European Union, UNDP, UNESCO, and USAID. According to Professor Umar, the current privatization program and the increased concern for environmental integrity have improved Nigeria's prospects for renewable energy technologies. Of equal importance is the introduction of the bill on "Solar Energy Development and Utilization" by the National Assembly.

3.2 Professor Umar reiterated the need for RE activities to be commercialized, profitable, and private sector-driven in order to ensure comprehensive adoption of renewable energy technologies. The first step to achieving this is to remove identified barriers, some of which he mentioned, and then to evolve policy measures and strategies that would enhance those already existing. Such strategies may involve developing a program for rural electricity supply using solar PV home systems and solar-powered rural water pumping schemes.

3.3 Professor Umar expressed gratitude to the international development partners who have been providing assistance in this effort. He asked the press to rise to the challenge of exercising their influence on all strata of society in order to ensure that renewable energy technology is adopted as our conventional energy source.

4

WORKSHOP DELIVERY

- 4.1 The workshop was delivered in six sessions:
- Current Status of Renewable Energy Technologies around the World
 - Renewable Energy in Nigeria: Economic Challenges and Opportunities
 - Renewable Energy Financing and Industry
 - Policies and Strategies for the Development of Sustainable Renewable Energy Markets
 - Discussion Group Meetings (breakout sessions)
 - Policy Lessons and Next Steps for Nigeria.

Current Status of Renewable Energy Technologies around the World

4.2 The papers presented during this session were “U.S. Energy Challenges and Opportunities” by John Brodman and “Renewable Energy Technology Development in Nigeria” by Professor C.E. Okeke.

4.3 The paper by John Brodman discussed the national energy policy of the United States and how it provides the opportunity for that country to address energy challenges. It was shown that the US energy supply is broken down in the following way: petroleum: 38.4 percent, natural gas: 23.3 percent, coal: 22.5 percent, nuclear: 8.0 percent, and renewables: 6.8 percent. The disaggregation of consumption shows that residential and commercial use consumed 36.1 quads, industrial use was responsible for 35.8 quads, and transportation used 27.1 quads. However, electricity use is on the increase due to demands of economic growth, and this is characterized by an increase in the use of natural gas. The paper mentioned some power outages and provided statistics to support the fact that the U.S. electricity generation, delivery and transmission infrastructures are aging and are not capable of providing the level of reliability and quality required for the digital age. In effect, higher demands are being placed on electricity generation, transmission and distribution, and this accentuates the looming lack of generation capacity and possible transmission bottlenecks.

4.4 Considering the above inadequacies and the enormous power needs of the U.S, Mr. Brodman said, solving the potential electricity infrastructure needs completely, efficiently and economically will not be accomplished by building new facilities that make and deliver power over long distances. The expanded use of smaller-scale, modular and distributed on-site resources, capable of providing “six nines” of reliability, would be an important part of the solution. In addressing the above challenges, transiting from the analog to the digital age will require a confluence of events including

concretizing the national energy policy, enacting the Hydrogen Reauthorisation Bill, and utility restructuring. Other measures include investing in transmission, distribution and generation capacity additions. Implicit in this transition is the crucial role of public-private partnerships in the development of next-generation technologies that are needed to sustain the increased demands.

4.5 John Brodman also highlighted the activities of the Office of Power Technologies (OPT) that is responsible for leading the national effort to develop and support clean, competitive, reliable renewable energy, distributing natural gas, and developing power delivery technologies for the 21st Century. In addition to its other programs in all areas of renewable energy technologies, a key aspect of the OPT portfolio is the creation of hybrid systems intended to capture synergies between renewables and natural-as-fired systems. Equally highlighted were the research and development focus on photovoltaics, wind energy systems, geothermal energy, biopower technologies, high temperature superconductivity, hydropower, and thermally activated systems. The paper also provided insights on the hydrogen program goals, distributed gas-fired technologies and challenges of combined heat and power (CHP.) In conclusion, Mr. Brodman mentioned current activities and partnerships in Africa, involving the United States Department of Energy and geared towards promoting renewable energy technologies on the African continent.

4.6 Mr. Taylor's paper on "Lessons Learned from the NREL Village Power Programme" described the lessons learned by the National Renewable Energy Laboratory of the US Department of Energy (NREL) staff during their participation in various pilot projects. This information will help the renewable energy-based rural electrification (RERE) community to implement increasingly more sustainable projects that will lead to widespread application. These lessons were classified as institutional aspects, pilot project characteristics, implementation processes, and technology development needs.

4.7 The paper stated that institutional aspects could make or break the long-term sustainability of the project. Adequate attention has to be paid to establishing effective partnerships, establishing and nurturing maintenance support infrastructure, tariff design, reflecting actual cost and quality of service, and linking rural development programs for development coordination. Other issues include the need to accommodate RE solutions by planning agencies and the concept of life cycle costing needs being integrated into the training of planning officials. Communications must be open, complete, and transparent. A pilot project must perform well technically, and emphasis should be placed on delivering the best end-use service for the least overall system cost in terms of energy efficiency and high quality of service. Other issues include replicability, developing multiple demonstration projects, designing modular systems that can be incrementally grown, encouraging diesel retrofits, monitoring performance, and ensuring cost sharing.

4.8 Implementation needs to be seen as part of a long-term process, and to be backed up with political will. It is also necessary to aid the transition from the pilot to the commercial replication phase with multiple regional projects, local capacity building, strong commitment of partners and substantial technical assistance. The paper also stated that RE projects should be driven by need and supported by a good administrative structure. It is important to explore the use of hybrid systems, and to ensure effective controls on the components of the systems. Cost-effective application engineering is also required for a corrosive and electrical-storm-sensitive environment. Metering and billing problems should be addressed. Reliable and adequate resource data is necessary. The market for integrators and packaged systems also needs to be developed.

4.9 In summary, the paper stated that RE solutions for village power applications could be economical, functional, and sustainable, and that properly managed pilot projects could lead to cost-effective, renewable energy-based village power systems.

4.10 Professor Okeke's paper, "Renewable Energy Technology Development in Nigeria," highlighted the installed electricity capacity in the country, identified some problems currently associated with power supply, and discussed inadequacies in the available power transmission lines. The paper also discussed the renewable energy sources available, areas of consumption, and their end uses. The paper highlighted the contributions of the Energy Commission of Nigeria and its research centers in the areas of solar water heaters, solar crop and manure dryers, improved wood and other domestic solid fuel stoves, solar cookers and solar energy application in poultry production. The paper also highlighted the qualities of biogas as a clean source of energy with little or no adverse effect on the environment. This was supported by statistics on the percentage contribution of biomass to energy demands in some countries. The prospects of biogas technology and its application in various areas of agriculture were discussed.

4.11 In explaining the benefits of solar PV the paper presented examples of some solar PV electrification projects in Nigeria and the results of two surveys of PV systems installation carried out by the ECN. The results gave the status of these systems in nine states of the country and areas of application via water pumping, refrigeration, lighting, village electrification, and radio, telecommunications, and TV. Data, classified by type of application, was also provided on the percentage share of installations nationwide from 1990 – 1998. Professor Okeke discussed some barriers to RE technology development, including poverty, poor infrastructure, inadequate research and development, and other factors. He said that the easiest way of creating demand for RE facilities is to create the necessary awareness through advertising, demonstration centers, subsidization, provision of financial assistance, harmonization of policies, direct government involvement, and removal or reduction of import duties on solar energy facilities and components.

4.12 In conclusion, Professor Okeke mentioned that Nigeria might draw some inspiration from India's experience. During the last fifty years, India invested heavily in technical education, embraced computerization, and produced 250,000 scientists and engineers a year.

4.13 Participants discussed the many ways of storing renewable energy sources (e.g. on fishing boats) so that they can be used to alleviate poverty. Two storage methods identified are batteries and pumped storage. International donor agencies were implored to assist Nigerian scientists and physicists in adopting the manufacturing of renewable energy devices, which would ultimately encourage local production, once demand rose. The need for partnerships was emphasized, especially partnerships among USDOE, other international donor agencies, ECN and local entrepreneurs. Participants also highlighted the possibility of using the African Growth Organisation Act (AGOA) to foster the deployment of renewable energy resources.

4.14 To ensure that research institutions involved in renewable energy development complement one another, participants urged them to network with the ECN's research centers and to take advantage of these research centers' facilities. Mention was made of the manufacture of some renewable energy devices, e.g. inverters and charge controllers, at UNILAG and NCERD, Nsukka. What is required is to remove tariffs on PV systems and add value locally to reduce costs. Participants also reiterated the need to conduct more surveys and to create awareness of the existence and capability of renewable energy resources.

Renewable Energy in Nigeria: Economic Challenges and Opportunities

Four papers were presented during this session.

4.15 Dr. E.J. Bala presented the paper, "Economic Comparison of Solar PV, Grid Extension and Diesel Generating Set for Rural Development" by Iloeje et al. The instrument employed for comparing these three power delivery systems was the Unit Energy Cost (UEC,) which signifies the cost of unit energy produced by a power system throughout its lifespan, with all costs discounted at present value. This economic analysis was hinged on the Life Cycle Cost (LCC,) from which the UEC was derived. The system with the least UEC would be the alternative with the best comparative economic advantage. In conducting the economic analysis for each of these systems, their cost components were classified into capital, operation, and maintenance.

4.16 The calculations for the LCC and UEC were based on a general assumption of a 22 percent interest rate, an inflation rate of 7 percent, and a calculated discount value of 0.27 (27 percent.) These calculations were also supported with specific assumptions depending on the components, operating voltage, and time. UEC values from these systems were then plotted on a graph as a function of distance and power load, if they were employed to supply power to an isolated rural settlement located some distance away from the nearest 33KV high-tension point. This revealed that UEC for a given load increases linearly with the distance away from the 33KV for the generation set and grid extension, but decreases with increase in the load to be serviced for the three systems. Another important finding of the research was that the concept of distance for grid extension is relevant only when a power load to be serviced has been established. The results also showed that for distances greater than 20km, the diesel generation set would be cheaper than the extended grid system. However, at extensions beyond 40km, the solar PV power system would have some comparative economic advantage over the grid system.

4.17 The paper also noted that since the power requirements of many isolated rural communities may lie within the range of 50 kVA or less, solar PV may be better than the grid extension for distances greater than 200km. With regards to the diesel generating set and grid extension, the former is of comparative economic advantage at distances beyond 10km. In the paper's comparison of solar PV and the diesel generating set, the latter was found cheaper than the former at the 50 kVA load.

4.18 In conclusion, the paper drew the following inferences for a 24-hour-a-day load run:

- The grid extension becomes less economical when compared to the solar PV system at distances beyond about 200km.
- The grid extension becomes less economical when compared to the diesel generating set at distances beyond 10km.

4.19 The diesel generating set has a comparative economic advantage over the solar PV system.

4.20 The paper recommended that solar PV systems be used for power supply to low power demand centers located far away from grid. It also recommended intensifying research and development activities aimed at increasing the longevity and lowering the prices of solar PV components. This would increase the economic competitiveness of solar PVs even at larger power loads.

4.21 In the second paper, "Opportunities for Renewable Energy Technology Deployment in Nigeria" by Dr M.A.C Chendo, the presenter provided information on the pattern of human energy consumption throughout history. Dr. Chendo schematized the energy flow and its transformations, from production to consumption. He also linked energy and social issues in regard to the consequences of low

energy use. He highlighted two-way links between energy and poverty, energy and income status, energy and urbanization, etc. He called for a reappraisal and reexamination of current energy patterns, in order to achieve sustainable energy development. This reappraisal should be anchored to five crucial components: economic efficiency, equity, empowerment, environmental soundness, and peace. He also said that if Nigeria is to achieve its targeted goal in socioeconomic development, energy consumption must soar. A possible way of doing this would be to make efforts to conserve conventional fuels and increase their efficiency, while simultaneously increasing the use of renewable energy sources.

4.22 Dr. Chendo discussed the quantities of available energy resources and their percentage contribution to the energy mix in the country. He summarized important characteristics of new renewable energy sources, and provided information on damages from energy-related pollution. He suggested that incentives for exploring and exploiting renewable energy included depletion of fossil fuels, rural dependence on biomass, a changing energy industry and the need to increase energy use. He also highlighted the benefits of RE technology and stated his belief that a successful transition from non-renewables must rely largely on political will.

4.23 After identifying some barriers to RE development, Dr. Chendo mentioned that the greatest challenge was cost. He described viable options for enhancing the use of RE technologies. He listed some energy-related options which would address social problems, and spoke of potential areas for deploying RE technologies. He discussed rural energy needs and their present sources in Nigeria. He disaggregated RE technologies by sectoral applications, namely electrical and thermal applications of RE. He provided some examples of stand-alone RE applications for households and communities

4.24 In conclusion, Dr. Chendo spoke of the urgent need to adopt and deploy appropriate renewable energy technologies in the energy sector, as an intervention measure to improve Nigeria's energy use. Doing this will require a radical change from the present norm, through (a) enabling policies and legislation, (b) access to more adequate levels of energy services, and (c) meeting key economic and social objectives.

4.25 The paper "Barriers to Expanding the Market for Renewable Energy Technology " by Mr. Muiy Lawal discussed the available renewable energy technologies and their relevance to the needs of Nigerian society in meeting the demand for sustainable energy in both urban and rural dwellings. Of all the RE resources, it is generally accepted that solar energy is the most universally available, especially in Nigeria with its six to eight peak sun hours and high irradiation levels. According to the presenter, five key issues are important in uncovering the barriers that tend to stifle the widespread adoption of RE technologies to meet the day-to-day demands for energy. These are:

- The lack of an awareness campaign, featuring promotion of and information about technologies that are available to satisfy the demand for energy from cheap and naturally renewable resources
- The initial cost of RE systems in comparison to conventional and existing technologies
- The suitability of existing RE technologies to meet identifiable energy demands of both urban and rural dwellers
- The competition offered by parallel and existing energy technologies, because of their comparative ease of deployment, maintenance, and operation.
- Advantages of RE technologies over the conventional forms.

4.26 In summary, Mr. Lawal identified the basic obstacles to the expansion of the market for RE technologies in Nigeria as:

- Low technological development
- Absence of government incentives
- A low level of RE promotional activities
- The availability of cheaper and subsidized grid power
- Resistance to change
- A general lack of awareness and concern for the environment.

4.27 The last paper in this session, "Telecommunication Energy Systems: Application of Renewable Energy in NITEL," was presented by Engr. Orokunle on behalf of the Managing Director of NITEL. It dealt with the energy requirements for the provision of telecommunication services in Nigeria and the evolving technologies deployed by the organization. The presenter explained the range of services provided by NITEL and the components of its Domestic Network Communication (DNC) and Long Distance Communication (LDC.) He also itemized the energy problems as traceable to the irregular availability of Automotive Gasoline Oil (AGO) and Premium Motor Spirit (PMS,) unavailability of spare parts, security lapses, equipment vandalisation, and budgetary constraints. To keep in line with the International Telecommunications Union (ITU) energy specifications, NITEL has over the years been carrying out modifications in its operations to enhance reliability to 13-9s (i.e. 99.9 percent.) These modifications include the adoption of the Flywheel Motor Alternator (FMA,) generating sets operating on mutual standby with or without NEPA Supply, a trailer set, and meeting telecommunication equipment cooling requirements.

4.28 The organization has begun to introduce RE sources in some of its installations. These installations are the pilot scheme of turbine generator at Ilaro Local Exchange, and the solar generators in the digitalized trunk routes between Abuja and Maiduguri. However, experience from operating the solar energy system has shown that there is a need for an alternating current source to power the cooling systems of the unit, and a need for highly experienced professionals to operate the unit. For enhanced adoption of RE technologies, NITEL is considering options that address both reliability and costs. In order words, optimization of available resources and professionally re-engineered options are being considered. Those in the field of RE systems include:

- A hybrid of solar systems and turbine generators (with or without batteries)
- Turbineto turbine on hot standby
- Fuel cells.

4.29 In conclusion, the presenter stated that the use of solar technology in telecommunication has proved to be efficient and reliable, especially in the networks in the northern states. However, solar hybrid with other renewables is accompanied by higher economic indices and reliability figures. The pursuit of the perfect power plant for the organization is a continuous search.

4.30 The speech delivered by Alhaji Saka Aleshinloye addressed "The Desirability of Exploring Alternative Energy Sources in Nigeria." Mr. Aleshinloye said that in the near future, the world would be compelled to resort to alternative energy sources because of the rapid depletion of hydrocarbons. This situation also applies to Nigeria, and is worsened by the adulteration of kerosene and its unfavorable price. Mr. Aleshinloye acknowledged the existence of various sources of alternative

energy in the country. He stated that affordability should be the main focus in adopting any alternative energy source, and mentioned solar power as the alternative energy source with the lowest recurrent or running cost. He urged federal and state governments to begin encouraging the design and production of solar-powered hardware, especially domestic appliances. Mr. Aleshinloye concluded his speech with suggestions that Nigeria's president should abolish the tariff on the importation of solar components and encourage each state government to establish a solar village in its respective state.

Renewable Energy Financing and Industry

4.31 The three papers delivered during this session dwelt on the financing and funding of renewable energy projects.

4.32 Mr. Alex Otti's paper, "Market-Driven Funding for Renewable Energy Projects," stated that renewables have to be embraced as an energy source in view of the depletion of the world's oil resources and the environmental friendliness of renewables. Mr. Otti mentioned that the federal government recently contracted with a firm to examine the feasibility of exploiting renewable energy sources in the Nigerian energy sector. He explained the advantages and disadvantages of solar power and gave a brief history of the development of wind power.

4.33 Mr. Otti emphasized that the crucial issue in funding a renewable energy project is the viability of private sector funding. The primary aim of a bank assisting any project is an assurance that the project would generate enough cash flow to pay itself back at a reasonable margin. Mr. Otti also mentioned the existence of gaps in the nation's power generation. These gaps create opportunities for investments, but investments must be weighed against the risks inherent in any project. The identified risk factors within this context are technology, market, output, supply, transportation, regulation, and financial and external environment. A proper evaluation of these risks determines the funding mix, which could be one or a combination of debt, equity, vendor financing, and multilateral agencies.

4.34 In conclusion, Mr. Otti stated that market-driven funding for renewable energy is possible if attention is paid to the issues identified as risks, and if the risks are satisfactorily mitigated. This mitigation should be guaranteed by government, in order to create an environment that enables the private sector to take over where the government stopped.

4.35 Mr. H.R. Heeroo's presentation, "International Development Funding Programmes for Renewable Energy," stated that lack of finance, together with the absence of institutional, legislative, and regulatory environments, as well as other factors, constituted barriers to renewable energy technologies. Mr. Heeroo said that international development funding for programs on renewable energy was based on two issues of global concern, namely poverty and climate change. Equally, the high initial investment costs are such that the programs' promoters would have difficulties in committing their resources, thus the necessity for international development funding. To support this, the paper presented data supporting the fact that the initial investment cost of power generating plants from renewable source is significantly higher than plants based on generation from diesel, which is a fossil fuel.

4.36 The presenter mentioned the Global Environment Facility (GEF,) World Bank, the African Development Bank (ADB,) Bilateral donors, E and Co, and E7 Fund for Economic Development as some sources of funds. The GEF operates a Small Grants Programme (SGP,) which provides financial and technical support to projects that conserve and restore the natural world. Its implementing agencies are UNDP, UNEP, and the World Bank, while the ADB is a GEF executing agency. The World Bank advances loans for renewable energy projects through its three lending windows, the International Development Association (IDA,) the International Bank for Reconstruction and Development (IBRD,)

and the International Finance Corporation (IFC.) Other funding sources available at the World Bank for renewable energy projects include the Renewable Energy and Energy Efficient Fund for Emerging Markets (REEF,) the Small and Medium Enterprises Programme (SME Programme,) and the Solar Development Group (SDG.) ADB funds are also available through three windows, the ADB, the African Development Fund (ADF,) and the Nigerian Trust Fund (NTF.) The United States, Japan and EU member states were mentioned as principal sources of bilateral finance for renewables.

4.37 In conclusion, Mr. Heeroo cautioned that the availability of funds alone will not ensure the success of renewable energy projects, and that countries will have to set up the right institutional framework to regulate the sector and operate a tariff policy. This framework should take into consideration the environmental costs of the various means of energy production. Of equal importance is an effective public consultation process that would ensure that all stakeholder views are addressed. When these conditions are in place, the International Development Funding Programme would support renewable energy development, resulting in a win-win situation.

4.38 The paper on issues and options for “Financing Alternative Energy Projects in Africa” and was delivered by Mr. Robert Chronowski. He introduced the Alternative Energy Development Division (AED) of IRG Ltd. as an international venture that was incorporated to promote and participate in the commercial development of alternative energy and energy efficiency improvement projects. Its experience includes working with multiple biomass resources and municipal solid waste (MSW,) singly or in combination with other fossil fuels. The commercial framework of the AED is built on the need for energy, an enabling government policy, available energy resources, a friendly and cooperative energy buyer, a realistic cost-based energy pricing structure, seller and buyer credit worthiness, access to capital, and a contractual basis to do business. The latter is the Power Purchase Agreement (PPA.) Mr. Chronowski explained key elements of the PPA and emphasized that the use of alternative energy resources is attractive now that the relationships between economic growth, energy, environment, global climate change, sustainable development, and free market competition are becoming better understood.

4.39 In setting the optimum project size, the AED project structuring considers resource availability, capital cost options, heat rate variations, O&M cost variations, expected equipment life, process efficiency upgrades, and finance tradeoffs. Identified barriers to financing alternative energy projects included high project development to investment cost ratio, small total investment requirement, longer term debt financing, difficulty in guaranteeing project cash flow, and weak basis for non-recourse financing. Others barriers include inaccurate perception of risks, higher financial cost for alternative energy services, and weak project developers. In his discussions on strategies needed to overcome the financial barriers, Mr. Chronowski stated that large and medium scale alternative energy projects need to operate within the same financing rules that are applied to conventional energy projects, and to seek assistance to level the financial playing field. With regard to small-scale projects, they need to develop innovative financial mechanisms to cascade affordable financing and to seek assistance in building institutions, infrastructures, and capacity. He provided detailed strategies for the primary alternative energy systems.

4.40 The presenter acknowledged the existence of many instruments for financing alternative energy projects, but said that equity, debt and grants characterize the majority of funding sources for such projects. He enumerated the sources of equity financing, including project developers, venture capitalists, equity fund investors, equipment suppliers, regional development banks, and institutional and individual investors. With regard to sources of debt financing, he mentioned international and national commercial banks, multinational development banks (MDBs) and their private sector arms, debt-equity investment

funds, equipment suppliers, and private investors. The identified sources of grant financing included the Global Environment Facility (GEF,) international and bilateral development agencies, foundations, and national and local agencies. A number of evolving alternative energy project finance supporters were also mentioned.

4.41 A number of innovative financing mechanisms are emerging to help meet the growing demand for financing alternative energy projects. These include energy service companies (ESCOs) and micro-utilities-cooperatives, leasing companies, vendor credits, targeted project credits, acceptance of equipment as collateral by suppliers, support for project preparation and development, GEF and activities implemented jointly (AIJ and JI.) The paper then concluded that successful project development depended upon a framework of commercial conditions to enable the ultimate project financing, and that the planned establishment of a commercial framework in any country will greatly facilitate cost effective and widespread development of the available alternative energy options.

4.42 Engr. Ayodele Osewa's paper, "Micro-Credit Financing of Renewable Energy in Ondo State," provided an insight into Basiri Multipurpose Cooperative Union as an association interested in promoting RE technology adoption. An organogram of the union, its operational mode, functions of the board of trustees, and Union Exco were detailed in the presentation. The paper then concluded that the process of dissemination of the available sustainable RE technologies would become faster and easier if funds are made available to build, at least, a plant in each senatorial district in Ondo state.

4.43 Key issues raised by participants included the need to focus on all available sources of RE with emphasis on traditional energy supplies, especially the most viable ones. However, adequate consideration should be given to environmental integrity; e.g. use of charcoal should be complemented with planting fuel wood trees. It was also emphasized that government should not be a barrier to RE development. Rather, it should encourage the use of a demand-driven, rather than supply-driven, approach, to drive the RE scheme in the country. Mention was also made of the need to further empower the ECN in discharging its statutory responsibilities, and that the bill before the National Assembly on the establishment of an Electricity Regulatory Commission would help in addressing some of the regulatory anomalies identified.

Policies and Strategies for the Development of Sustainable Renewable Energy Markets

4.44 Professor O.C. Iloeje addressed "Current Policies and Policy Proposals for the Development of Renewable Energy in Nigeria." According to the paper, the enactment of the Energy Commission of Nigeria (ECN) Decree (No. 62) of 1979 was the first concrete indication of government policy on renewable energy, and this was complemented with the establishment of two federal renewable energy centers in 1982-83. The first comprehensive draft policy for energy, including renewable energy, was produced in 1993 by the ECN and reviewed in 1996. The draft policy made provisions for each renewable energy resource and the paper aggregated the key provisions, taking into consideration similarities of the various resources. Strategies for implementing the policy were also highlighted according to the energy source. These included strategies common to solar, wind, hydro and biomass, additional strategies for hydropower, and strategies unique to wood fuel.

4.45 As an instrument for implementation of the policies and strategies, the paper listed economic and fiscal incentives to promote demand, supply, and manufacturing of renewable energy components and systems. The economic incentives are soft loans, subsidies and grants, waivers on purchase taxes, rebate on income taxes and levies, and capacity development. The fiscal incentives,

targeted at producers and providers of RE goods and services, include lower profit tax, tax holidays, reduction of import duty, capital allowance and relief, and demand stimulation. Professor Iloeje also highlighted major recommendations of a workshop organized jointly by the Solar Energy Society of Nigeria (SESN) and the ECN on the promotion of business and industrial activities in solar PV. These recommendations, which are before the relevant committees of the National Assembly, were meant to create an enabling environment for effective deployment of RE technologies.

4.46 The paper also noted that the Solar Energy Development and Utilisation Fund Bill has been introduced in the National Assembly. The bill is at the committee stage in the House of Representatives, while the senate has yet to commence debate on it. Mention was also made of the efforts being made by the ECN to get the recommended incentives adopted. The stages of development of the various RE resources were also mentioned. The two important developments that had stimulated interest in exploiting RE potentials were the privatization exercise and a growing need for environmental integrity. It was also appreciated that barriers needed to be identified and removed to increase the contributions of RE to the national energy mix. The paper concluded that the challenge for policy and policy strategy development should include adopting measures to address constraints in demand, supply and financing of RE projects. These measures should also facilitate the adoption and implementation of specific RE projects, especially in the rural areas, and be targeted at having an identified impact on the national energy mix.

4.47 Priyantha Wijesooriya discussed “International Experience – The Applications of Renewable Energy: The Case of Sri Lanka,” in which an overview of the country was presented along with its overall energy situation. Mr. Wijesooriya said that Sri Lanka had an installed power capacity of 1540 MW, made up of 80 percent hydropower and 20 percent thermal power, and that by a 2001 estimate, 40 percent of the population did not have electricity. He also listed the stakeholders involved in the renewable energy sector in the country and gave a history of its development.

4.48 In providing the current status of renewable energy, he mentioned existing systems and their installed capacities including solar-PV, micro and mini hydro, biomass, wind, and small wind generators. Noteworthy features for RE in the last 20 years included:

Pattiyola Integrated RE Project

- CEB 1975
- Suntec
- SoLanka and Sarovdaya Solar PV Programmes
- Panseeeyagama 1000 SHS Government-sponsored project
- ITDG's role in developing micro-hydro and promoting the concept of grid connected mini-hydro.

4.49 Other features are an ESD credit line and fiscal incentives by the Board of Investment Recognition. Activities supported by the GEF grant in the ESD credit line were mentioned and statistics of solar PV development in the country was provided.

4.50 Notable challenges experienced in renewable energy in the country included getting the microfinance organized for solar PV, safety engineering, environmental controls, and the CEB tariff position. The importance of energy resource mapping as vital to the renewable energy industry was also highlighted. In this light, wind energy mapping, solar resource distribution, sunshine data, biomass

verification, standards and specifications, policy facilitation, and fiscal and environmental considerations needed to be addressed. The policy formulation process was provided, along with other vital statistics on the use of renewable energy. . The paper concluded that it was the general aspiration of the renewable energy lobby in Sri Lanka that in the medium term, a significant contribution could be made to the national energy mix by renewable energy technologies.

4.51 Wendy Hughes presented the last paper in this session, “Market Driven Renewable Energy Development – Lessons Learned in World Bank-Assisted Projects,” by Wendy Hughes and Malcolm Cosgrove-Davies. The paper stated that renewable energy technologies (RET) in small rural emerging markets were mature but still not commercially attractive, and that most experiences in Africa were from projects financed by a single donor. Key characteristics of rural electricity customers that inhibit their embracing RET include (a) access to credit, (b) lack of understanding of the products of RET, (c) limited cash, (d) consumption matching seasonal income patterns, and (e) aversion to risk.

4.52 Equally, the private companies in renewable energy service are inhibited by the following: (a) short time horizons for payback, (b) limited equity and borrowing capability, (c) the difficulty of linking payment to services rendered (d) inability to compete with heavily grant-funded projects and (e) the scattered nature of rural customers. Other hindrances on the product side include high first cost, unfamiliarity of the products, and the difficulty of securing the products in local markets. Some features of the suppliers of RET were also enumerated.

4.53 Financiers’ concerns about RET include misperceptions, limited security, unfamiliar product, dispersed and unfamiliar customers, high transaction costs, non-regular income streams, and limited rural credit availability. The paper also identified some energy sector-specific, economy-wide and funding barriers. Challenges for deploying RET include affordability, misinformation, credit availability, market distortions, misallocation of risks, and high transactions costs. Others include non-supportive policies, unfamiliar product investment, and no national focal points for advice.

4.54 Key lessons learned from World Bank-assisted projects include the following:

- Encourage government to be the market enabler rather than the market
- Encourage non-conventional service providers
- Enforce standards and improve quality at the system level
- Reduce the transaction costs
- Increase affordability
- Manage risk.

4.55 In conclusion, the paper reiterated that the main objectives of the World Bank’s rural development are poverty alleviation and environmental sustainability. In these there is a key role for renewable energy. The paper also pointed out that the World Bank’s projects are increasingly supporting unconventional means of energy service delivery. The Bank’s strengths are in financing and encouraging the adoption of suitable policies by governments. The main challenges of RET include ensuring that businesses are financially and technically sustainable and that customers receive high quality and reliable services at affordable prices.

Discussion Group Meetings (Breakout Sessions)

4.56 Participants were divided into four working groups according to the following themes:

- Technology and manpower development
- Identification and removal of barriers
- Financing strategies for promoting renewable energy projects in Nigeria
- Project design.

Technology and Manpower Development

4.57 The group observed that inadequate manpower to sustain RE activities and lack of coordination in manpower development programs were constraints to the deployment of RE technology. Other identified constraints included inadequate and inappropriate levels of technology, widespread ignorance, and inadequate funding for research and development activities. The group offered policy recommendations to address proper education in RE technology and the need to enhance manpower development in RE.

Strategies proposed to enhance the policy recommendation included:

- Including RE in the curricular of secondary and tertiary institutions
- Empowering energy research institutions to offer training in RE technology
- Fabricating RE equipment locally
- Basing a substantial percentage of government-funded rural development programs on RE
- Setting up energy research centers in geopolitical zones where they are currently absent.

4.58 These strategies would require short, medium and long term programs. The short term would concentrate on setting up demonstration centers in all the states of Nigeria and short term training courses on RE at the two energy research centers. The medium term programs should focus on postgraduate courses in RE while the long term programs would involve the introduction of RE in the curriculum of secondary schools.

Identification and Removal of Barriers

4.59 Important issues that guided the group's discussion are the need for fossil fuel at affordable prices, the need for literacy, political instability, ignorance, lack of awareness, links between industries, and gross indiscipline. Others are poor funding for research and development, absence of an energy policy, high interest rates, and the absence of linkage between industries and research and development institutions.

To address the above, the group gave the following recommendations:

- Enact energy policy
- Create an awareness campaign to be led by ECN
- Deliberate a policy for capacity building in science and technology
- Create massive incentives and subsidies for research and development devices
- Federal government should direct state governments to set up solar villages in their respective states.

Financing Strategies for Promoting Renewable Energy Projects in Nigeria

4.60 The group noted the existence of various forms of funding but lamented the lack of awareness on how and where to access these funds. It also noted the need for capacity and awareness building and the need to be able to access proven technology as a first step to assemblage, and subsequently, manufacturing. It recommended that the ECN should serve as a link between donors and project developers and conduct an awareness campaign on sources of finance available for various RE types. An effective tool for achieving this would be for the ECN to develop a road map detailing where and how to access funds for RE. This road map should indicate the types of funds available for a variety of needs, conditions and resources.

The group gave three program proposals:

- ECN should organize donors as a platform for generating data for RE projects financing
- ECN should organize annual workshops or conferences to disseminate information and create awareness
- A “Renewable Energy Association of Nigeria” should be created to promote energy activities and programs across the country.

Project Design

4.61 It was noted that the content of a project design depends on the fund provider. In an ICEED presentation to the group it was mentioned that the main aims of rural energy provision are to address poverty alleviation and to reduce climate change. The group consented to project designs centred on solar home systems (SHS,) rural water pumping, biogas, and solar water heating, with emphasis on removing barriers to their adoption. In addressing this, key questions to be asked include priority areas, the extent to which they can be nationally driven, budgetary provisions, funds released so far, and how the available resources have been utilized. The use of SHS should be encouraged where the environment is most favorable. Mention was also made of the fact that biogas was justified because the most sustainable resource, firewood, was becoming expensive.

4.62 The group also observed that poverty alleviation should be used to sell RE, rather than environmental concerns being considered first. It was also agreed that energy services will lead to sustainable development, and that focus should be on identified technologies that could lead to poverty alleviation and sustainable development. The group recommended that project design should involve all stakeholders, with the ECN taking the lead, and with experts familiar with project design and operating environment of donor agencies also involved.

The following outline for project design was proposed:

- Context
- National priorities
- Action plans and RE programs
- Project rationale and objectives
- Expected outputs and objectives
- Project strategy and implementation arrangements
- Risk identification and analysis
- Project costing and budget

- Appendices:
 - Logical framework
 - Stakeholder participation
 - Incremental cost etc.

Policy Lessons and Next Steps for Nigeria

4.63 This is encapsulated in the communiqué presented at the end of the workshop.

5

DESIGN MEETING

Subject: Renewable Energy Development Program Proposal

5.1 The Design Meeting was initially scheduled to develop implementable project proposals on PV-based solar home systems and solar water pumping, as well as on biogas generators. However, in view of the development needs of the renewable energy subsector and of the priority need to implement the proposed renewable energy development program for Nigeria (of which the above projects are components,) the Design Meeting resolved to work instead towards the development of a “**Proposal on the Program for the Development of the Renewable Energy Market in Nigeria.**”

5.2 The program proposal, when developed, will be the basis of further discussions with various funding agencies and sources, who will be favorably disposed to assisting Nigeria in the implementation of the program. It will also be of value to private sector organizations, non-governmental organizations (NGOs,) community based organizations (CBOs,) and cooperatives who are interested in developing projects in the Nigerian renewable energy subsector.

5.3 While recognizing the requirements of time and expertise to develop a full program proposal, and in particular, the limited time available to the Design Meeting, the latter resolved to develop the guidelines to the proposal. Subsequently, the Energy Commission of Nigeria, in cooperation with support agencies, will convene a group of experts to develop the proposal, using the guidelines produced by the Design Meeting.

Guidelines for the Proposal on the Program for the Development of the Renewable Energy Market in Nigeria

5.4 The issues to be addressed are presented under the heading

Context - National context in which the program is located, as well as relevant regional and international issues

Demand - for renewable issue

Rationale - for the program

Aim

Objectives

Expected Outputs

Strategy and Implementation Arrangements

Risk Identification

Program Costing and Budget

Appendices

Context

(a) Macro environment

- Energy policies (overall and renewable energy)
- Environmental policy
- Other relevant policies, e.g. rural development
- Ongoing programs
- Things to be done to meet national obligations to various conventions
- Energy supply situation
- Implications of the privatization of energy sector industries, e.g. power and downstream oil and gas
- Transparency.

(b) Demand

- Estimate of demand, especially in rural areas unserved or unservable by conventional energy supply systems such as power grid, kerosene and fuel wood supply networks
- Selection of commercially viable areas or locations of demand

(c) Rationale

- Sustainable development
- Rural transformation - enabling infrastructure for social, political and economic development
- Poverty alleviation
- Environmental improvement (with references to supporting documents)
- Getting formal commitment to the program at the highest political level
- Specification of the project components of the program
- Adoption of multi-sectoral approach - i.e. use of various relevant agencies
- Definition and mobilization of funds for program preparation from possible sources (government of Nigeria, bilateral and multilateral)
- Structuring of cofinancing of the program's projects by counterpart sources (budgets and other provisions from government at all levels,) contributions from the conventional energy sector (i.e. oil, gas, power, etc.) bilateral and multilateral (GEF, WB, ADB, PCF, etc) sources, private sector, and civil society
- Phasing of each project
- Setting up preliminary market targets, involving conservative estimates of market penetration, within a defined time frame (ten years?) for the various renewable energy technologies, including
 - Solar-PV (home systems, water pumping, health clinics and centers)
 - Biodigesters
 - Mini and micro hydro
 - Biomass (rural power, grid supply, thermal energy including improved woodstoves and biomass briquettes)
- Project management, including identification and specification of the roles of the implementing agency, funding sources, consultants, project beneficiaries, etc.

Aim

To put in place a major-scale renewable energy program.

Program Objectives

- To solve energy supply stresses, especially in rural areas
- To remove barriers to development of a renewable energy market (barriers are as listed in 10.1 above)
- To create demand for renewable energy technologies
- To alleviate poverty
- To meet national environmental obligations and solve identified national environmental problems

Expected Outputs

- Awareness created
- Widespread utilization of renewable energy technologies achieved
- A viable renewable energy market developed
- Mechanisms for access to finance by project developers created
- Economic and social empowerment of the rural population achieved
- Etc. (each of the program components listed in 10.3 above will produce a set of expected outputs.)

Implementation Strategy and Arrangements

- Participation of all stakeholders, namely government ministries and agencies at federal, state and local government levels, communities, the private sector, NGOs, CBOs, International Agencies.

Risk Identification (and Mitigation)

- SWOT analysis
- Effects of changes in macroeconomic policies
- Effects of political changes (not expected to affect program particularly in view of bipartisan support for it)
- Technological risks
 - non-acceptance
 - New and better technologies
 - Operational and maintenance competence
 - Quality control
- Financial risk
 - Competition in sourcing of funds
 - Budgetary risks
- Market risks
 - Market (demand) not available or not developing as expected
 - Competition from other energy technologies
- Environmental Risks
 - Assessment of negative environmental effects including social and economic effects on resident populations
- Climatic Risks.

Program Costing and Budget

- Costing and budget
- Estimation of the funding potentials of the cofinancing sources and allocation of the budget accordingly.

Appendices

- Matrix of whole program
- Briefs on the stakeholders and consultation made
- Incremental cost analysis (especially for GEF-supported projects.)

Conclusion

5.5 The program development exercise should lead to the conclusion that with regards to the program's aim and objectives

- The problem has been understood
- There is a critical mass of political, bureaucratic, professional and financing interests for solving the problem
- A methodology has been developed for addressing the problem in a sequential manner
- Results potentials have been estimated
- The supporting and investment costs to achieve the results have been estimated.

6

Communiqué

Communiqué of the National Workshop on Creating Demand and Removing Barriers to Renewable Energy Market Development in Nigeria

6.1 Participants and stakeholders from key federal, state, and local government agencies, community leaders, the organized private sector, international donor agencies, academia, and financial institutions met in Abuja November 13 – 17, 2001 to examine approaches to expanding the market for renewable energy technologies in Nigeria.

6.2 The workshop was organized by the Energy Commission of Nigeria, in collaboration with the United States Agency for International Development, the World Bank, the United Nations Development Program, the African Development Bank, the Government of Norway, and Shell Petroleum Development Company Nigeria, Limited. Workshop participants identified barriers to market development and proposed strategies for removing them. The following are specific observations and recommendations of the workshop:

BARRIERS IDENTIFIED

1. Inefficient energy pricing structure which is disadvantageous to renewable energy development
2. Lack of awareness about renewable energy potentials.

PROPOSED STRATEGIES FOR THE REMOVAL OF IDENTIFIED BARRIERS, SO AS TO MAKE POSSIBLE RENEWABLE ENERGY MARKET DEVELOPMENT IN THE COUNTRY

1. Awareness

- Setting up of renewable energy awareness programs (including solar villages in each state)
- Building up partnerships between government, private sector and civil society.

2. Technology Research and Development

- Intensifying R & D in renewable energy science and technology as well as policy analysis and market research
- Carrying out manpower development for the design, production, installation and maintenance of renewable energy technology

- Developing and implementing national standards on renewable energy devices and systems
- Establishing an enabling regulatory framework for the renewable energy industry and renewable energy based power

2. Economics and Financing

- Establishment of public and private sector partnerships to mobilize financial resources for the development of the renewable energy industry
- Developing and making available a road map to guide project developers in their efforts to access financial resources
- Promoting an energy pricing structure which is market-based and which reflects long term benefits and environmental costs
- Removing all tariffs on imported renewable energy technologies and systems
- Establishing a renewable energy development fund and a mechanism for operating the fund.

3. Institutional Reforms

- Providing institutional linkages between public and private sector institutions and renewable energy end users with regards to funding and information exchanges
- Strengthening the capacity of various renewable energy institutions.

4. Policies

- Enactment of an integrated national energy policy
- Enactment of an enabling renewable energy policy

PROPOSED RENEWABLE ENERGY DEVELOPMENT PROGRAM FOR NIGERIA

6.3 The proposed program consists of:

1. AWARENESS CREATION

- Holding of regular media programs
- Establishment of at least one solar village (integrated rural village energy supply) project in each state of the federation
- Holding of regular stakeholders' dialogues, at state and national levels, on renewable energy policies, programs, project financing, and other issues.

2. DATA ACQUISITION AND MAPPING

- Review and improvement of solar map
- Review and improvement of wind map
- Improvement of small-scale hydro potential data and mapping
- Survey of biomass resources potentials of the country
- Development of electricity grid map.

3. INVESTMENT SUPPORT

- Establishment of a renewable energy development fund

- Development of a road map for accessing investment and support funds (sources of funds, types of funds and how to access them) for renewable energy projects
- Putting in place policy incentives to make renewable energy technologies economically competitive.

4. CAPACITY BUILDING

- Organizing “Train-the Trainers” workshops on renewable energy for secondary and tertiary educational institutions
- Developing renewable energy curricula for tertiary institutions and facilitating their introduction
- Upgrading the facilities and personnel of renewable energy research centers for scientific, technological, policy and market research and development
- Running training workshops on selected renewable energy technologies at professional, entrepreneurial, operational, maintenance, and fabrication levels
- Putting in place a program to facilitate the local manufacture of renewable energy components and systems, especially solar-PV modules and biodigesters, and the establishment of solar-PV balance-of-system component maintenance.

5. DEVELOPMENT AND IMPLEMENTATION OF COMPREHENSIVE POLICY, LEGAL AND REGULATORY INSTRUMENTS

- To be carried out through appropriate mechanisms.

6. DEVELOPMENT AND IMPLEMENTATION OF SPECIFIC RURAL ENERGY PROJECTS

These projects include:

- Solar home systems
- Solar water pumping
- Biogas
- Solar rural clinics
- Solar cookers
- Improved biomass stoves
- Biomass-based power generation
- Etc.

Annex 1

Background

Electricity is a critical input to the development process. Today many Nigerians are without access to electricity, a majority of them in the rural areas. Fuelwood is the prime energy source for cooking and heating. This promotes ill health, soil erosion and desertification. Poor access to modern forms of energy and energy conversion technologies hamper economic growth and diminishes the quality of life and the effectiveness of essential social and community services, such as water supply, education health and commission.

National grid extension alone will not meet the country's rural electrification objectives, either quickly or in an affordable and sustainable manner. It needs to be supplemented with off-grid renewable energy based options such as solar-PV, wind and small-scale hydropower. Renewable energy based alternatives to the current fuelwood technologies need to be utilised. The challenge of increasing access to electricity, implementing alternatives to fuelwood and meeting other energy needs, through renewable energy, creates the motivation for this workshop.

Workshop Objectives

The overall objective of the workshop is to examine the approach to expanding the market for renewable energy technologies in Nigeria. Workshop participants will also identify barriers to market development and strategies for removing them. The workshop seeks to achieve the following specific objectives:

- Assist in developing renewable energy strategies in Nigeria;
- Examine existing barriers to demand growth and commercial deployment of renewable energy technologies in Nigeria;
- Develop policy initiatives and programmes for increasing renewable energy based power supplies to rural sectors such as household, health, education, water supply, agriculture and micro enterprises.
- Examine opportunities for building financial mechanisms to support the growth of renewable energy industry;
- Examine the potential role of public/private partnerships in creating a viable renewable energy market; and
- Design renewable energy based power supply projects for support by the Global Environment Facility and other funding sources.

Participants

Participants will include stakeholders such as key Federal, State, and local Government officials and community leaders, the private sector, donor agencies and financial institutions.

OPENING CEREMONY**DAY 1: November 13, 2001****08:30 – 09:30****Registration and Arrival of Participants****Session 1****Opening Session and Exhibition**

09:30 – 12.00

09:30

Introductions - by the MC, **Dr. M.A.C. Chendo****National Anthem****Opening Prayers** - as directed by the Chairman

09:40

Chairman's Opening Remarks - Chief Olusegun Agagu

Honourable Minister for Power & Steel

09:50

Welcome Address - The Chief Host, **Prof. I.H. Umar**

Director-General, Energy Commission of Nigeria

10:00

Brief Goodwill Address:Hon. Minister for Environment, **Alh. Mohammed Kabir Said**Hon. Minister of State for Sc. & Tech., **Mrs Pauline Tallen**

HE, Executive Governors Present

HE, Norwegian Ambassador to Nigeria, **Mr. Dag Nissen**Mission Director, USAID/Nigeria, **Mr. Thomas Hobgood**Country Representative, the World Bank, **Mr. Mark Tomlinson**

Resident Representative, UNDP, **Prof. Mbaya Kankwenda**

- 10:30 **Declaration of Workshop Open - the Chairman**
- 10:32 **Keynote Address - Prof. A.T. Suleiman**, Former Vice Chancellor
Federal University of Technology, Yola
- 10:52 **Vote of Thanks - Prof. O.C. Iloeje**, Director,
Energy Planning and Analysis, Energy Commission of Nigeria
- 10:55 **Closing Prayers** - as directed by the Chairman
- National Anthem**
- 11:00 **TOUR OF EXHIBITION** - Led by the Chairman
- 11:30 **PRESS CONFERENCE** - by Director General, Energy Commission
of Nigeria, **Prof. I. H. Umar**
- 11:30 Coffee Break
- Rapporteurs - **Mr. A.O. Yusuf and Mr. A. D. El-Ladan**
Energy Commission of Nigeria

TECHNICAL SESSIONS

- Session 2** **Current Status of Renewable Energy Technologies around the World**
- 12.30 - 14.00
- Chairman **Professor A.S. Sambo**
Vice Chancellor, ATBU, Bauchi
- Rapporteur **Dr. B. G. Danshehu and Mr. J.S. Olayande**
Sokoto Energy Research Centre/Energy Commission of Nigeria
- Paper 1: International Developments in Key Renewable Energy**

	Technologies (PV, Wind, Biogas, Small Scale Hydro, etc)
Speaker	Mr. John Brodman, <i>United States Department of Energy/USAID Mission, Nigeria</i>
	Paper 2: Renewable Energy Technology Developments in Nigeria
Speaker	Professor C. E. Okeke Director, National Centre for Energy Research and Development, Nsukka.
	Discussion
14:00 – 15:00	Lunch
Session 3	Renewable Energy in Nigeria: Economic Challenges and Opportunities
15:00-17:00	
Chairman	Hon. Idris Abdullahi Umar Chairman, House Committee on Power and Steel
Rapporteurs	Dr. B. Garba and Mr. A.O. Yusuf Ag. Director, Sokoto Energy Research Centre/Energy Commission of Nigeria
	Paper 3: Economic Comparison of Solar-PV, Grid and Diesel:
Speaker	Dr. E. J. Bala Energy Commission of Nigeria, Abuja
	Paper 4: Opportunities for Renewable Energy Deployment in Nigeria
Speaker	Dr. M. A. C. Chendo Dept. of Physics University of Lagos
	Paper 5: Barriers to Deployment of Renewable Energy in Nigeria
Speaker	Mr. Muyi Lawal Managing Director, Solar Electric, Jos

Paper 6: Telecommunication Energy Systems: Application of Renewable Energy in NITEL

Speaker **By NITEL**

17:00-18:00 Meeting of Solar Energy Companies
Meeting of Non-Governmental Organizations

18:30 Dinner, Courtesy of Shell Petroleum Development Company of Nigeria, Ltd

DAY 2: WEDNESDAY NOVEMBER 14, 2001

Session 4 Renewable Energy Financing and Industry.

09:00-11:00

Chairman **Mr. H.R. Heeroo**, African Development Bank

Rapporteurs **Dr. O. Okparaku and Mr. J.S. Olayande**
National Center for Energy R & D/ECN

Paper 7: Market Driven Funding for Renewable Energy Projects

Speaker **Mr. Alex Otti**, First Bank Nigeria, Plc.

Paper 8: International Development Funding Programmes for Renewable Energy

Speaker **Mr. H.R. Heroo**
African Development Bank

Paper 9: Micro Financing and Low Interest Funding Schemes

Speaker **Mr. G. Ehigianusoe**
Director, Lift Above Poverty Organisation

Paper 10: Financing Alternative Energy Projects in Africa: Issue and Options

Speaker **Robert A. Chronowski**
Alternative Energy Dev./ Consultant: US Dept. of Energy

11:00 – 11:30	Tea/Coffee Break
Session 5	Policies and Strategies for the Development of Sustainable Renewable Energy Markets
1130 – 13:30	
Chairman	John Brodman United States Development of Energy/USAID Mission, Nigeria
Rapporteurs	Dr. (Mrs) R. Osuji and Dr. B.G. Danshehu Department of Physics, University of Nigeria, Nsukka/Sokoto Energy Research Center
	Paper 11: Renewable Energy Development Policies and Strategies: Key Ingredients and International Experiences
Speaker	Robert A. Chronowski Alternative Energy Dev./ Consultant: US Dept. of Energy
	Paper 12: Current Policies and Policy Proposals for Development of Renewable Energy in Nigeria
Speaker	Prof. O. C. Iloeje Energy Commission of Nigeria
	Paper 13: International Experience in the Application of Renewable Energy in Rural Development: The case of Sri Lanka
Speaker	Dr. Priyantha Wijesooriya President, Solar Energy Industry Association of Sri Lanka
	Paper 14: Market Driven Renewable Energy Development Strategy
Speaker	Wendy Hughes World Bank
13:30 –14:30	Lunch
Session 6	Discussion Group Meetings (Breakout Sessions)

14:30 –16:30	Group I:	Technology and Manpower Development
	Chairman:	Professor O.A Odukwe
	Rapporteurs:	Dr. B. Garba and Mr. A.O. Yusuf
	Group II:	Identification and Removal of Barriers
	Chairman:	Professor Sambo
	Rapporteurs:	Dr. B. G. Danshehu and Mr. A.D. El-Ladan
	Group III:	Financing Strategies for Promoting Renewable Energy Projects in Nigeria
	Chairman:	Robert Chronowski
	Rapporteurs:	Dr (Mrs) R. Osuji and Mr. J.S. Olayande
	Group IV:	Solar Energy for Rural Development: Project Design
	Chairman:	Professor Emmanuel Oladipo, UNDP
	Rapporteur:	Dr. O. Okparaku
Session 7	Closing Session: Policy Lessons & Next Steps for Nigeria	
16:30	Chairman's Opening Comments -	Prof. I.H. Umar , Director-General, Energy Commission O Nigeria
16:35	Presentation of Group reports -	Group Chairmen
17:20	Discussion of Group reports -	Participants
17:50	Closing Remarks and Policy Directions for the Future -	Chairman
18:00	Closing Prayers - as directed by -	Chairman
	Rapporteur -	MacLewis Engineering Ltd.
18:30	Cocktail: Courtesy of Shell Petroleum Development Company of Nigeria, Ltd.	

DAY THREE: THURSDAY NOVEMBER 15TH 2001

Pre-registration Form

Name of Delegate:

Name of Organisation:

Position:

Address:

Tel:

Fax:

E-mail:

Exhibition Request Form

Name of Organisation:

Address:

Tel:

Fax:

E-Mail:

Exhibition fee is N10,000 per exhibition space

Space Requirement (tick)

Outdoor ()

Indoor ()

Send pre- registrations, requests and enquiries to:

International Centre for Energy Environment & Development (ICEED)

Tel 09 234 3836

Fax 09 234 7181

Email: iceed2@hotmail.com

Annex 2

LIST OF COMPANIES THAT ATTENDED THE SOLAR ENERGY COMPANIES MEETING OF 14TH NOVEMBER, 2001

1. Solar Electric Systems
P.O. Box 667
Jos
Tel: 073-450102
MD: Mr. Muyi Lawal

2. AP Sunlite Ltd
AP Apapa Complex
PMB 1036, Abuja
Tel: 5872512 Fax 587 0426
GM: Ike O Nwana
e-mail: ionwana@ap-sunlite.com
ionwana@yahoo.com
support@ap-sunlite.com

3. Sunrays Electric Company Ltd
P. O. Box 2718,
Kaduna
Tel: 062-216645 Fax 062-216645
Manager: Etta Leko

4. Maclewis Engineering Services Ltd
Suit 19 Kigoma Street
Wuse Zone 7,
Abuja FCT
Officer: Emecheta Emeka

E-mail: emechetaemelean@usa.net

5. Philip Project Center
8 Kofo Abayomi Street
Victoria Island
Lagos
Staff: Obalolu Adekanmi
e-mail: obalolu@usa.net

6. Guisiano Nig. Ltd
1 Ani-Ahbia Street
Asaba
Delta
Tel: 056-280223

7. ICEED
Plot 523 Misau Street
Garki
Abuja
Tel: 09-234 3836
Fax: 09-2347181
CEO: Ewa Otu Eleri
e-mail: iceed@hotmail.com

Annex 3

LIST OF ENERGY AND ENVIRONMENT NGOs THAT ATTENDED THE MEETING OF THE NGOs OF 14TH NOVEMBER, 2001

1. Drought and Desertification Control Action Team (DD-CAT)
A Close, House 7
Asokoro
(Off Jimmy Carter Street)
Abuja
Head of Organization: Engr G. O. Akubuiro

2. National Association of Science and Technologies
(NASTES)
Oyewo's Residence
Community High School Junction
P. O. Box 20
Igbaye
Osun State
HoO: Mr. Omotoso Gbemiga Olatunde

3. Ossai Chuks A.
1 Dada Bello Close
(Off Iju Itako Road)
Agege, LAGOS
E-mail: povalcrus@yahoo.com

4. Community Level Environmental Action Network
65 Zik Avenue

Uwani

Enugu

HoO: Mr. Eche A. J. Igwe

E-mail: youth advocates@aleto.com

5. Resources and Food Security Foundation (REFSEF)

15 Ibikunle Avenue

(Off Bodija Avenue)

P. O. Box 9984

University P.O.

Ibadan

HoO: Dr. Ike E. Ezeagu

e-mail: refsef@hotmail.com

ikezeagu@yahoo.com.uk

6. Basiri Multipurpose Co-operative Union

8 Otutubiosun Street

Akure, Ondo State

HoO: Chief J.K. Ajomola

Officer: Ayodele Osewa

E-mail evfuta@engineer.com

7. Western Sahara Environmental Society

5 ATC Road

Katsina

Also

AP 32 Fatika Road

Kaduna

HoO: Abubakar Garba

E-mail: westernsaharaenviron@yahoo.com

8. NESDEN

1 Evergreen Close

Ogbonda Estate

(Off Artillery)

- Rumuogba
P. O. Box 14244
Port-Harcourt
Contact Person: Patrick Ijeagwa
E-mail: opatrick@yahoo.com
9. ICEED
Plot 523 Misau Street
Garki II
Abuja
Tel: 09-234 3836 Fax: 09-2347181
HoO: Ewah Otu Eleri
E-mail: eeleri@hotmail.com
10. Solar Energy Society of Nigeria
C/o Energy Commission of Nigeria
Plot 701 C Central Area
PMB 358, Area 10 Garki
Abuja
President: Prof. O. C. Iloeje
E-mail: ecn@hyperia.com
11. Soltec Energy and Environmental Network
2 Wogu Street
D/Line
Port-Harcourt
HoO: Dr. Mrs C. U Okujagu
12. Itado Women Multipurpose Co-op. Society
8 Otutubiosun Street
(Off Arakade Road)
Akure
Ondo State
Exec. Secretary: Mrs. V. A. Osewa
E-mail: evefuta@engineer.com

13. Grass-roots Resource Development Initiative

124A Okigwe Road

Owerri

HoO: Mr Agugua Azubuike

St. Ernest.

14. Rural Development Research Organization

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1	Dupe Aduloju	FRCN (Network)
2	Sunday Okoh	The Comet
3	Austine Malu	Daily Times
4	Emmanuel Aziken	Vanguard
5	Ewache Ajefu	National Interest
6	Timothy Golu	Standard News Papers
7	Uche Anunne	New Nigerian
8	Tunde Bakare	News Express
9	Oota Andrew	Liberty
10	Alifa Daniel	The Guardian
11	Tayo	Thisday
12	Badejo Ademuyiwa	BusinessDay
13	Nuhu Abdullah	Radio Nigeria
14	Christiana Oguguo	Aso Radio
15	Wale Igbintade	The Anchor
16	Kalu N. Emetu	Abuja Today
17	Mike Odiakose	Nigerian Observer
18	Sheyin Ife	NAN
19	Ibrahim Amoka	The Agenda
20	Mark Mayah	The Source Magazine
21	Mba Agbai	National Ambassador Newspapers
22	Soji Eze	Nigerian Tribune
23	Suleiman Abdullah	NTA Network News (Camreaman)
24	Saudra Aende Ighur	NTA Network News (Reporter)
25	Richard Ihediwa	The Monitor
26	David Paul Odey	Cross River Radio & TV Services
27	Ofem Uket	Nigerian Chronicles
28	Tony, Ejiofor	Policy Magazine

Annex 5

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LIST OF TECHNICAL PAPER SERIES

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
SUB-SAHARAN AFRICA (AFR)			
Africa	Power Trade in Nile Basin Initiative Phase II (CD Only): <i>Part I: Minutes of the High-level Power Experts Meeting; and Part II: Minutes of the First Meeting of the Nile Basin Ministers Responsible for Electricity</i>	04/05	067/05
Côte d'Ivoire	Workshop on Rural Energy and Sustainable Development, January 30-31, 2002. (French Only)	04/05	068/05
Ethiopia	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Ethiopia - Action Plan.	12/03	038/03
	Sub-Saharan Petroleum Products Transportation Corridor: Analysis And Case Studies	03/03	033/03
	Phase-Out of Leaded Gasoline in Sub-Saharan Africa	04/02	028/02
	Energy and Poverty: How can Modern Energy Services Contribute to Poverty Reduction	03/03	032/03
East Africa	Sub-Regional Conference on the Phase-out Leaded Gasoline in East Africa. June 5-7, 2002.	11/03	044/03
Kenya	Field Performance Evaluation of Amorphous Silicon (a-Si) Photovoltaic Systems in Kenya: Methods and Measurement in Support of a Sustainable Commercial Solar Energy Industry	08/00	005/00
	The Kenya Portable Battery Pack Experience: Test Marketing an Alternative for Low-Income Rural Household Electrification	12/01	05/01
Malawi	Rural Energy and Institutional Development	04/05	069/05
Mali	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Mali - Action Plan. (French)	12/03	041/03
Mauritania	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Mauritania - Action Plan. (French)	12/03	040/03
Nigeria	Phase-Out of Leaded Gasoline in Nigeria	11/02	029/02
	Nigerian LP Gas Sector Improvement Study	03/04	056/04
	Taxation and State Participation in Nigeria's Oil and Gas Sector	08/04	057/04
	Initiating the Bank's Peri-Urban/Rural and Renewable Energy Activities in Nigeria. Workshop Proceedings.	06/05	073/05
Regional	Second Steering Committee: The Road Ahead. Clean Air Initiative In Sub-Saharan African Cities. Paris, March 13-14, 2003.	12/03	045/03
	Lead Elimination from Gasoline in Sub-Saharan Africa. Sub-regional Conference of the West-Africa group. Dakar, Senegal March 26-27, 2002 (French only)	12/03	046/03
	1998-2002 Progress Report. The World Bank Clean Air Initiative in Sub-Saharan African Cities. Working Paper #10 (Clean Air Initiative/ESMAP)	02/02	048/04
Senegal	Regional Conference on the Phase-Out of Leaded Gasoline in Sub-Saharan Africa	03/02	022/02
	Elimination du Plomb dans l'Essence en Afrique Sub-Saharienne Conference Sous Regionales du Groupe Afrique de l'Ouest. Dakar, Senegal. March 26-27, 2002.	12/03	046/03
South Africa	South Africa Workshop: People's Power Workshop.	12/04	064/04
Swaziland	Solar Electrification Program 2001—2010: Phase 1: 2001—2002 (Solar Energy in the Pilot Area)	12/01	019/01

<i>Region/Country</i>	<i>Activity/Report Title</i>	<i>Date</i>	<i>Number</i>
Tanzania	Mini Hydropower Development Case Studies on the Malagarasi, Muhuwesi, and Kikuletwa Rivers Volumes I, II, and III	04/02	024/02
	Phase-Out of Leaded Gasoline in Oil Importing Countries of Sub-Saharan Africa: The Case of Tanzania - Action Plan.	12/03	039/03
Uganda	Report on the Uganda Power Sector Reform and Regulation Strategy Workshop	08/00	004/00
WEST AFRICA (AFR)			
Regional	Market Development	12/01	017/01
EAST ASIA AND PACIFIC (EAP)			
Cambodia	Efficiency Improvement for Commercialization of the Power Sector	10/02	031/02
China	Assessing Markets for Renewable Energy in Rural Areas of Northwestern China	08/00	003/00
	Technology Assessment of Clean Coal Technologies for China Volume I—Electric Power Production	05/01	011/01
	Technology Assessment of Clean Coal Technologies for China Volume II—Environmental and Energy Efficiency Improvements for Non-power Uses of Coal	05/01	011/01
	Technology Assessment of Clean Coal Technologies for China Volume III—Environmental Compliance in the Energy Sector: Methodological Approach and Least-Cost Strategies	12/01	011/01
Thailand	DSM in Thailand: A Case Study	10/00	008/00
	Development of a Regional Power Market in the Greater Mekong Sub-Region (GMS)	12/01	015/01
Vietnam	Options for Renewable Energy in Vietnam	07/00	001/00
	Renewable Energy Action Plan	03/02	021/02
	Vietnam's Petroleum Sector: Technical Assistance for the Revision of the Existing Legal and Regulatory Framework	03/04	053/04
SOUTH ASIA (SAS)			
Bangladesh	Workshop on Bangladesh Power Sector Reform	12/01	018/01
	Integrating Gender in Energy Provision: The Case of Bangladesh	04/04	054/04
	Opportunities for Women in Renewable Energy Technology Use In Bangladesh, Phase I	04/04	055/04
EUROPE AND CENTRAL ASIA (ECA)			
Russia	Russia Pipeline Oil Spill Study	03/03	034/03

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MIDDLE EASTERN AND NORTH AFRICA REGION (MENA)

Regional	Roundtable on Opportunities and Challenges in the Water, Sanitation And Power Sectors in the Middle East and North Africa Region. Summary Proceedings. May 26-28, 2003. Beit Mary, Lebanon. (CD)	02/04	049/04
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LATIN AMERICA AND THE CARIBBEAN REGION (LCR)

Brazil	Background Study for a National Rural Electrification Strategy: Aiming for Universal Access	03/05	066/05
Bolivia	Country Program Phase II: Rural Energy and Energy Efficiency Report on Operational Activities	05/05	072/05
Ecuador	Programa de Entrenamiento a Representantes de Nacionalidades Amazónicas en Temas Hidrocarburíferos	08/02	025/02
Guatemala	Evaluation of Improved Stove Programs: Final Report of Project Case Studies	12/04	060/04
Mexico	Energy Policies and the Mexican Economy	01/04	047/04
Nicaragua	Aid-Memoir from the Rural Electrification Workshop (Spanish only)	03/03	030/04
	Sustainable Charcoal Production in the Chinandega Region	04/05	071/05
Regional	Regional Electricity Markets Interconnections — Phase I Identification of Issues for the Development of Regional Power Markets in South America	12/01	016/01
	Regional Electricity Markets Interconnections — Phase II Proposals to Facilitate Increased Energy Exchanges in South America	04/02	016/01
	Population, Energy and Environment Program (PEA) Comparative Analysis on the Distribution of Oil Rents (English and Spanish)	02/02	020/02
	Estudio Comparativo sobre la Distribución de la Renta Petrolera Estudio de Casos: Bolivia, Colombia, Ecuador y Perú	03/02	023/02
	Latin American and Caribbean Refinery Sector Development Report – Volumes I and II	08/02	026/02
	The Population, Energy and Environmental Program (EAP) (English and Spanish)	08/02	027/02
	Bank Experience in Non-energy Projects with Rural Electrification Components: A Review of Integration Issues in LCR	02/04	052/04
	Supporting Gender and Sustainable Energy Initiatives in Central America	12/04	061/04
	Energy from Landfill Gas for the LCR Region: Best Practice and Social Issues (CD Only)	01/05	065/05

GLOBAL

	Impact of Power Sector Reform on the Poor: A Review of Issues and the Literature	07/00	002/00
	Best Practices for Sustainable Development of Micro Hydro Power in Developing Countries	08/00	006/00
	Mini-Grid Design Manual	09/00	007/00

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	Photovoltaic Applications in Rural Areas of the Developing World	11/00	009/00
	Subsidies and Sustainable Rural Energy Services: Can we Create Incentives Without Distorting Markets?	12/00	010/00
	Sustainable Woodfuel Supplies from the Dry Tropical Woodlands	06/01	013/01
	Key Factors for Private Sector Investment in Power Distribution	08/01	014/01
	Cross-Border Oil and Gas Pipelines: Problems and Prospects	06/03	035/03
	Monitoring and Evaluation in Rural Electrification Projects: A Demand-Oriented Approach	07/03	037/03
	Household Energy Use in Developing Countries: A Multicountry Study	10/03	042/03
	Knowledge Exchange: Online Consultation and Project Profile from South Asia Practitioners Workshop. Colombo, Sri Lanka, June 2-4, 2003	12/03	043/03
	Energy & Environmental Health: A Literature Review and Recommendations.	03/04	050/04
	Petroleum Revenue Management Workshop	03/04	051/04
	Developing Financial Intermediation Mechanisms for Energy Efficiency Projects – Focus on Banking Windows for Energy Efficiency	08/04	058/04
	Evaluation of ESMAP Regional Power Trade Portfolio (TAG Report)	12/04	059/04
	Gender in Sustainable Energy Regional Workshop Series: Mesoamerican Network on Gender in Sustainable Energy (GENES) Winrock and ESMAP	12/04	062/04
	Women in Mining Voices for a Change Conference (CD Only)	12/04	063/04
	Renewable Energy Potential in Selected Countries: Volume I: North Africa, Central Europe, and the Former Soviet Union, Volume II: Latin America	04/05	070/05

Last report added to this list: ESMAP Technical Paper 073/05.