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ESMAP TECHNICAL PAPER

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Nigeria: Expanding Access to Rural Infrastructure Issues and Options for Rural Electrification, Water Supply and Telecommunications

December 2005

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

PURPOSE

The Energy Sector Management Assistance Program (ESMAP) is a global technical assistance partnership administered by the World Bank and sponsored by bi-lateral official donors, since 1983. ESMAP's mission is to promote the role of energy in poverty reduction and economic growth in an environmentally responsible manner. Its work applies to low-income, emerging, and transition economies and contributes to the achievement of internationally agreed development goals. ESMAP interventions are knowledge products including free technical assistance, specific studies, advisory services, pilot projects, knowledge generation and dissemination, trainings, workshops and seminars, conferences and roundtables, and publications. ESMAP work is focused on four key thematic programs: energy security, renewable energy, energy-poverty and market efficiency and governance.

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FUNDING

ESMAP is a knowledge partnership supported by the World Bank and official donors from Belgium, Canada, Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom. ESMAP has also enjoyed the support of private donors as well as in-kind support from a number of partners in the energy and development community.

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ESMAP
c/o Energy and Water Department
The World Bank Group
1818 H Street, NW
Washington, D.C. 20433, U.S.A.
Tel.: 202.458.2321
Fax: 202.522.3018

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(ESMAP)

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Acronyms

BFM	Burutu-Forcados Mini-grids
BPE	Bureau for Public Enterprises
CAS	Country Assistance Strategy
CPRP	Community-based Poverty Reduction Project
ECN	Energy Commission of Nigeria
DFID	Department of International Development
FMPS	Federal Ministry of Power & Steel
FGN	Federal Government of Nigeria
GEEG	Gas Engine Embedded Generation
GSM	Global System of Mobile Communication
IPP	Independent Power Producer
kW	Kilowatt
LEMP	Local Environment Management Project
LGA	Local Government Area
LGHQs	Local Government Headquarters
MW	Megawatt
NAOC	Nigeria Agip Oil Company
NCC	National Communication Commission
NEP	National Energy Policy
NEPA	National Electric Power Authority
NEPP	National Electric Power Policy
NERC	Nigerian Electricity Regulatory Commission
NGO	Non-Government Organization
NPIRD	National Policy on Integrated Rural Development
NTP	National Telecommunications Policy
NWC	National Water Commission
NRWSSP	National Rural Water Supply and Sanitation Program
NWSSP	National Water Supply and Sanitation Policy
PSP	Private Sector Participation
PV	Photovoltaic
RDSS	Rural Development Sector Strategy
REA	Rural Electrification Agency
REB	Rural Electricity Board
REF	Rural Electrification Fund
RUWASA	Rural Water Supply and Sanitation Agency
RUC	Riverine Utilities Company
SEP	Sapele Energy Park
SHS	Solar Home System
SME	Small and Medium Enterprises
SMEIS	Small and Medium Enterprises Investment Scheme
SPDC	Shell Petroleum Development Company

SWB	State Water Board
UAF	Universal Access Fund
UAP	Universal Access Provision
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial and Development Organization
WRMS	Water Resources Management Strategy

1

Background

1.1 Over two thirds of Nigeria's population resides in rural areas. Increasingly, poverty in the country is wearing a rural face. From 28.3 % in 1980, poverty among the rural population grew to 51.4 % in 1985, has since risen to 69.8 % in 1996[1]. Poverty tends to affect men and women differently. Women are generally less educated, more vulnerable, deprived and powerless than their male counterparts.

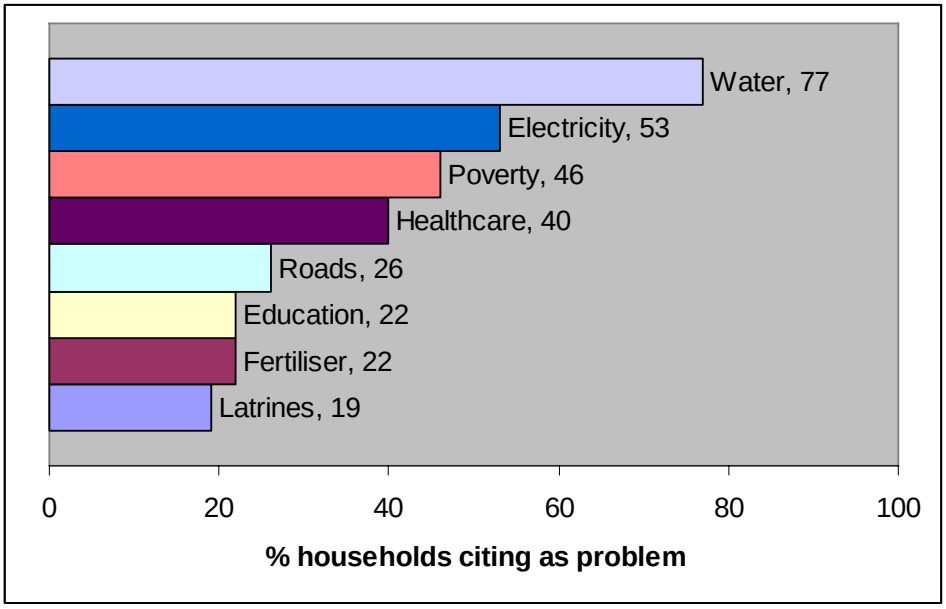
1.2 Poor people experience insecurity and vulnerability (drought, desertification, flooding, deforestation, diseases, volatile commodity markets etc.); lack of empowerment to influence public policies according to their priorities; and lack of opportunities for income generation and benefits from markets. Access to education, safe water supply, sanitation, health, modern energy, telecommunications and roads are important in reducing vulnerability and increasing prosperity.

1.3 Critical infrastructure services, like water, energy and telecoms come at relatively high costs in rural communities. While scale, density, distance and purchasing power of rural communities tend to increase investment costs, inappropriate government policies can also drive the prices for these commodities up in rural areas. Essential expenditures on water and energy often represent a large proportion of the disposal incomes of rural households. While some of these costs are monetized, others are informal and come in form of time and drudgery spent by mostly women and children in collecting water and gathering wood.

1.4 In a survey conducted by UNICEF in Nigeria, water supply and energy services topped the list of the most pressing needs of rural households. In the survey, 77% of households rated access to adequate and safe water as the most critical element in escaping poverty. Access to electricity came second at 53%.

[1] Federal Government of Nigeria (2001) Interim Poverty Reduction Strategy Paper (Draft)

Figure 1.1: Major Problems Identified by Rural Households in Nigeria



Source: National Rural Water Supply and Sanitation Program

1.5 The return to democratic rule in 1999 created an environment conducive to overhauling the machinery of government. One objective was to increase the effectiveness of service delivery. The following is a review of emerging reform programs in rural electrification, water supply and telecoms, the critical issues and implications for infrastructure service provision.

2

Objectives

2.1 The objective of this work is to assist Nigeria in understanding the issues which constrain expansion of rural access to infrastructure, and develop appropriate strategies to overcome these barriers. The importance of this objective is emphasized by the results of the UNICEF study above and by a recent Private Sector Assessment for Nigeria, in which infrastructure was identified as the most severe constraint for private sector development in the country. Due to the similarities in constraints and mitigation measures, this work considered power, water, and telecoms. However, the major focus was on the power sector. Telecoms sector reform and rural access development is significantly advanced in comparison to power; and several initiatives involving rural water delivery are currently underway including a social fund and community driven development project. In comparison to these two sectors, energy, and specifically electricity, is far less advanced with regard to rural access, and as discussed below, lack of access to electricity is also an important constraint in increasing access to telecoms and water.

2.2 Specifically, this work seeks to:

- Identify and detail workable approaches for expanding rural & semi urban access to local level infrastructure especially power, telecoms, and water.
- Identify specific "intervention points" with promising prospects for sustainable expansion of rural infrastructure access;

2.3 In carrying out this work, the team consulted with a wide range of stakeholders including representatives of federal, state and local governments, potential investors, banks, NGOs and other international development agencies. A list of stakeholders consulted and documents reviewed during the study is included in Annex 1.

2.4 State-level workshops were conducted for stakeholders from two states: Delta and Niger. These workshops focused on identifying and developing concepts for pilot investments in rural infrastructure. The approach was to allow for a wide range of ownership structures to accommodate public, private, cooperative and mixed arrangements. The team worked with potential investors in identifying and clarifying key framework issues, development of business and financial plans. Participants at these workshops included representatives of state agencies, State Chambers of Commerce,

Agriculture and Industry, potential investors, federal agencies, and representatives of donor agencies. Participation lists and minutes from these workshops are included in Annex 2.

3

Structure of Report

3.1 For each sector – electricity, water and telecoms – the report considers (i) current status, and (ii) the main issues, barriers and constraints to expanding access. Specific examples of attempted or proposed initiatives covering one or a combination of these sectors, based on case studies presented at state-level workshops, are included to highlight the impact of the issues and barriers noted above. The final section discusses potentially workable approaches, and factors or changes from the current situation which would be critical in the success of these approaches.

4

Expanding Access to Electricity

(i) Current status in electricity access

4.1 About 100 million Nigerians remain "in the dark" without access to electricity. Under a "business-as-usual" scenario, the number of Nigerians without access to electricity will increase over time. While estimates of the new connection rate per year – financed by federal and state rural electrification programs – are difficult to confirm, it appears that the new connection rate to the NEPA grid system is well under 50,000 connections per year nationally and probably closer to 30,000 per year – rates well below the number of new households created every year.

Electricity sector policy, legal and regulatory reforms

4.2 The Federal Executive Council approved a National Electric Power Policy in 2001 – setting out principles and steps to create an enabling regulatory framework, restructure the industry and facilitate more investments into the sector. It sets the context for improving efficiency, scaling up access to services and improving environmental management. The rural electrification component envisages a full menu of rural electrification options including grid and off-grid, thermal as well as renewable energy. It seeks to link rural electrification expansion with economic development objectives and encourage the active participation of states, local communities and the private sector.

4.3 The Electric Power Sector Reform Act is presently before the National Assembly. It provides for the establishment of a Rural Electrification Fund (REF) and a Rural Electrification Agency (REA) to administer the Fund. The REF shall promote, support and provide rural electrification through public and private sector participation in order to achieve more equitable regional access to electricity; maximize the economic, social and environmental benefits of rural electrification subsidies; promote expansion of the grid and development of off-grid electrification; and stimulate innovative approaches to rural electrification. The Federal Government has commissioned work on the development of a Rural Energy Strategy. The strategy will among other things, outline sets of principles guiding the development of rural energy, identify specific implementation activities including the design of the REF, setting up of a REA and the design of a low cost distribution system.

4.4 In 2003 the Federal Executive Council approved an energy policy for Nigeria. The policy makes provisions for the coordinated development, utilization and management of all energy resources. In particular, it allows for rural energy supply with conventional (petroleum products, gas, coal, electricity) and non-conventional and renewable (solar, wind, small-scale hydro, biomass, fuel wood etc.) alternatives. Several provisions in the policy are relevant to in the effort to scale up energy services for rural areas, and these include:

4.5 Developing and harnessing solar, wind, hydropower and wood biomass energy resources and integrating them into the national energy mix.

- Taking particular measures to ensure the use of these energy resources in rural energy supply.
- De-emphasizing the use of wood fuel and promoting alternative energy resources and technologies to wood fuel.
- Exploiting and utilizing coal in an environmentally friendly manner, including especially the use of coal briquettes as an alternative to wood fuel.

The national rural electrification program

4.6 The National Rural Electrification Program was started in 1981 with the aim of connecting all the country's local government headquarters and some important towns to the national grid. The program is managed by the Federal Ministry of Power and Steel and implemented by NEPA. Currently about 600 of the 774 Local Government Headquarters in the country have been connected to the national grid. However, as in many other countries even when a town or village is connected to the grid, local distribution networks may be very slow to develop when, as is frequently the case in Nigeria, government funding for the distribution network is unavailable.

4.7 The Rural Electrification Program is facing several structural constraints. The country requires over 6000 MW of electricity to meet present demand. Current output is around 3000MW, much of which is not put to use due to poor power transmission and distribution infrastructure. Secondly, the much-awaited institutional reforms – setting out a national regulator, unbundling NEPA, and privatizing the new business units have yet to be fully implemented. Third, the rural electrification program has been supply driven by political considerations rather than social and economic considerations. This has led to unnecessarily high costs and done little to control mismanagement and corruption. Fourth, funding is a constraint as almost all funding for rural electrification comes from the federal and state budgets. It is clear that grid extension alone will not meet universal rural electrification coverage cost-effectively within a reasonable timeframe but major barriers to market development for off-grid options such as renewable energy technologies remain.

(ii) Issues / barriers / constraints to expanding access to electricity

4.8 *Implementation of policy, legal and regulatory framework.* The National Electric Power Policy, the National Energy Policy and the National Electric Power Reform Bill set the framework for developing the power sector to assist in jumpstarting the economy and in confronting the worsening conditions of poverty in the country. These statutes clearly separate the role of the regulator from the service provider, create opportunities for increased private sector investments, increased competition and provide for special assistance to vulnerable groups including very poor households and those in rural areas. However, these enabling frameworks are yet to be made operational. Delayed passage of the Power Sector Reform Bill and delayed implementation of the reforms mandated therein creates uncertainties among investors on the commitment of government to liberalize the power sector. This is a significant barrier to private sector entry at all levels and stages of the electricity supply chain.

4.9 Specific issues of relevance to the development of entrepreneurship in rural electricity supplies include uncertainties that loom over the relationship with NEPA, particularly for grid-connected projects during this period of prolonged transition. The position of NEPA on several of these grid-tie initiatives is not immediately clear and encouraging. Further issues include the status of mini-grids and procedures for concessions. In Delta State where the development of investment proposals for rural electrification is more advanced, dissonance between representatives of NEPA and potential investors regarding the bounds of legality for private mini-grids illustrates this thick cloud of uncertainty.

4.10 *Current financial situation in the power sector.* NEPA's present tariffs for households are still below cost; and about half of revenue is not collected. Illegal connections, lack of a proper customer census and mismanagement are some of the factors contributing to this situation. In present pre-privatization stage, the performance of NEPA in revenue collection will influence the viability of private sector investments. If people do not have to pay their NEPA bills, they will not expect to pay for electricity supplied from another provider. An improvement in the overall performance of NEPA revenue cycle management will boost independent power supply businesses.

4.11 *Access to finance.* Access to finance constitutes a significant challenge to the development of electricity businesses. There is a dearth of money for long-term financing. Currently, domestic interest rates are in excess of 20%. Moreover, several factors combine to make Nigeria unattractive as destinations for international finance. High levels of corruption, political uncertainty and crime are some of the factors that reduce the appetite of foreign investors. Investors, international and domestic, are also wary of policy inconsistency and commitment by government to sustain reforms.

4.12 In the present circumstances, the emergence of the Small and Medium Enterprises Investment Scheme (SMEIS) – an equity scheme requiring all banks to set aside 10% of their profits to supports SMEs, represent a window of opportunity. Bureaucratic bottlenecks, poor business development capacity among potential energy entrepreneurs

and the reluctance of commercial banks to commit these funds have limited the scope of its performance.

4.13 *Poorly directed subsidies.* Indications are that the cost of candles, kerosene and wood to households exceed the cost of grid electrification, especially because of direct subventions to NEPA. The government subsidy only helps the relatively well-off portion of the population with access to the grid. Currently, subsidies are not output based but awarded according to political exigencies.

4.14 *Governance and business environment.* Corruption, bureaucratic bottlenecks and crime increase the cost of doing business. Permitting requirements in developing mini-grids or other forms of concessions will determine the level of bureaucratic bottlenecks. It is therefore important to have an effective and transparent regulator that facilitates rather than constrains investments in electricity services. Another area where good governance will be particularly important is in the process of procurement. Several components in rural electrification are imported into the country. Curbing the costs of bribes is important in the smooth running of rural electrification businesses. Vandalization of NEPA equipment has become endemic in many parts of the country. Beyond the financial costs, it reduces the reliability of services. It is uncertain how much this phenomenon is theft or community protest against NEPA's poor performance.

4.15 *Local capacity to deliver rural electrification.* In implementing rural electrification projects, several components such as concrete poles, wooden cross-arms, stay blocks, etc. are locally provided. However many of the capital intensive components consisting of conductors, insulators, cables, transformers, etc. are imported. Attempts have been made in the past to develop manufacturing capacity for several of the imported components. Nigeria has a vibrant electricity sales and service industry. This ranges from contractors, equipment vendors, consulting engineers, etc. Rural electrification has therefore in most cases been carried out by local contractors. However, capacity utilization within these companies is low as job orders are constrained by government budgets.

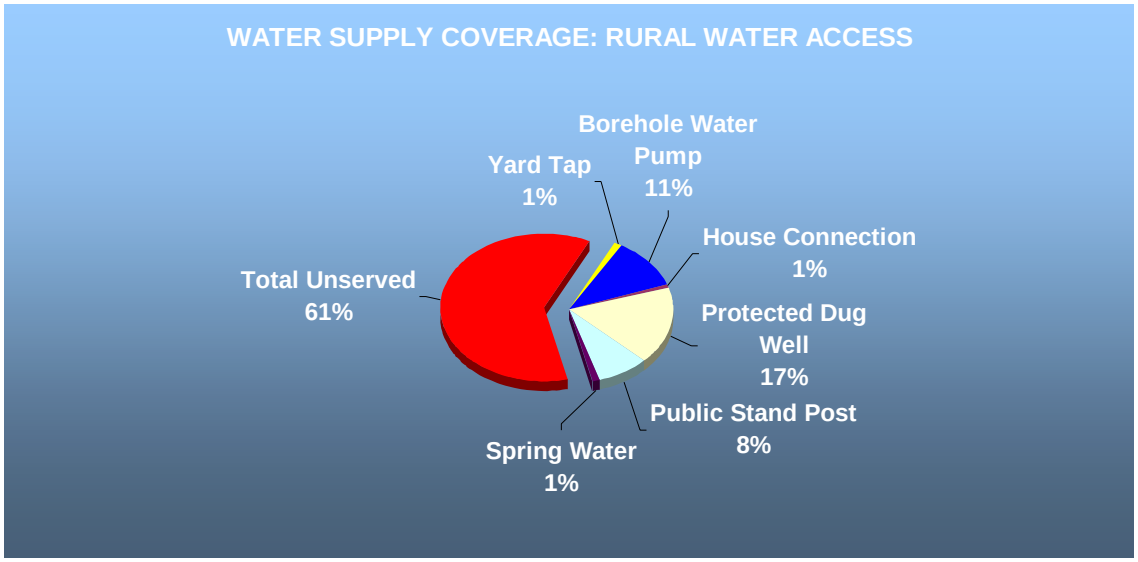
5

Expanding Access to Potable Water

(i) Current status in potable water access

5.1 Barely 40% of the population has access to safe drinking water. It has been estimated that better access to potable water could relieve the burden of water borne diseases by as much as would improvements in health care delivery.

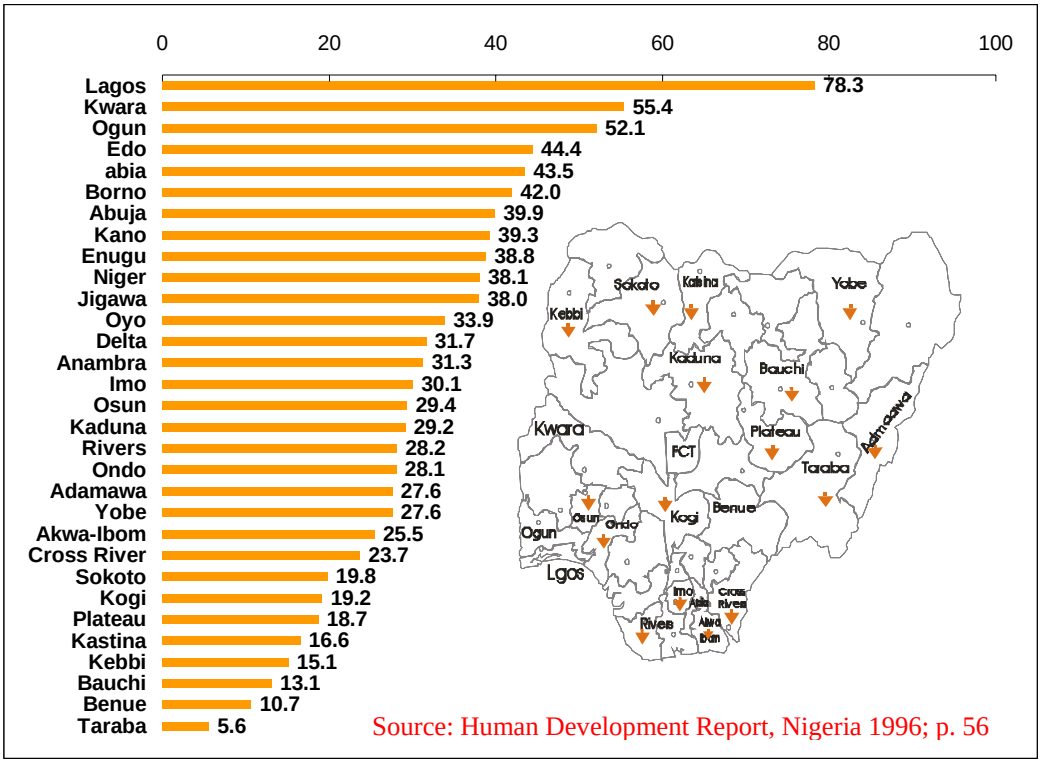
Figure 5.1: Water Supply Coverage: Rural Water Access



Source: Federal Ministry of Water Resource & Rural Development, 1996

5.2 In a survey published by the Federal Ministry of Water Resources, only 9% of respondents in rural areas have access to treated water (Figure 5.1). Though the supply of water is inadequate in all parts of the country, some states are more water stressed than others. Figure 5.2 which was based on the 30-state structure, existing early in the 1990s, illustrates the tremendous differential.

Figure 5.2: Percentage of population having access to safe water by State (1995)



Source: Human Development Report, Nigeria 1996; p. 56

5.3 In about two-thirds of the states, the population having access to safe water is less than 30%.

National water supply and sanitation policy

5.4 The NWSSP makes the supply of adequate water and sanitation a right for all Nigerians. The policy shares the responsibility of water supply and sanitation among all tiers of government, the private sector and communities. It recognizes water as an economic and social good, and the need to run water supply as business. The policy clearly identifies the need for reform and for private sector participation, and pays particular attention to vulnerable segments of society, particularly women and the poor.

5.5 The main policy objective is that all Nigerians should have access to safe water and sanitation at an affordable price. Equity, poverty alleviation and eradication of water borne diseases are priority considerations for provision of water supply. The substance of the reform consists in adopting proactive approaches and setting up coherent policies to guide the management of the entire supply sector, develop adequate delivery systems and ensure their implementation. Among the basic principles are:

- a more rational and effective distribution of responsibilities among the three tiers of government, **decentralization**;
- financial and economic independence and accountability of local agencies/ water boards, **divestiture**;

- involvement of the users right from planning stage and their financial contribution towards the investment costs, **community participation**;
- the direct responsibility of all users over recurrent costs, **economic value of water**;
- the government participation in the capital investment required as a **subvention** to the concerned institutions to permit the expansion of service in the unserved areas;
- the need to carry out **feasibility studies** to generate action plans for each State providing the framework for integrated management of resources;
- **Uniformity of criteria**, technical and financial, adopted; and
- The involvement of the **private sector** in all possible ways.

National rural water supply and sanitation program

5.6 The Federal Ministry of Water Resources in collaboration with State Water Corporations, the National Water Resources Institute, UNICEF, the European Commission and the World Bank are in a process of consultation with key stakeholders to formulate a National Rural Water Supply and Sanitation Program (NRWSSP) in consonance with the objective of the National Water Supply and Sanitation Policy.

5.7 The NWSSP objectives, targets and safe water consumption standards have implications for the NRWSSP. The overall goal of the NRWSSP is to consolidate, increase and sustain universal access to adequate quantities of affordable and safe water by the year 2015; as well as consolidate, increase and sustain universal access to hygienic sanitation facilities by the year 2020.

5.8 Among the key objectives of the Program are:

- To promote improved hygiene and sanitation practice by developing and applying appropriate participatory and social marketing methods and techniques that will lead to demand for household and communal sanitary facilities;
- To support, strengthen and enhance community management resulting in sustainability of water supply and sanitation services;
- To increase the capacity of Local, State and Federal government to assist communities to obtain the basic water supply and sanitation services that the communities themselves can maintain with private sector support;
- To increase the capacity of Local, State and Federal Governments, NGOs and Civil Society Organizations to deliver water supply, sanitation and hygiene services to communities experiencing crisis and outbreaks of endemic diseases;

- To increase the capacity of Local, State and Federal government institutions to manage program implementation in support of communities in an efficient and cost-effective manner;
- To enhance the capacity of the private sector to supply goods and services for the sub-sector;
- To support the poverty reduction program by reducing the disease and workload burden so that the poor and disadvantaged, especially women, in the rural areas, can lead a more productive and fulfilling life;
- To support the Nigerian Guinea worm Eradication Program through provision of adequate safe water to all Guinea worm endemic villages;
- To supplement the National Primary Health Care Program by promoting better health practices, focusing on safe water, good hygiene, diarrhea control and proper excreta disposal;
- To supplement the Universal Basic Education Program through the provision of water and sanitation facilities to make primary schools and junior secondary schools child and especially girl friendly; and
- To monitor the performance of the sub-sector for sound policy and strategy adjustment and development.

5.9 *Water Resources Management Strategy (WRMS).* The federal government with the support of the World Bank and DFID is undergoing a policy reform cycle aimed at overhauling the entire water resources management strategy. Comprehensive thematic studies and public consultation have been conducted. Currently, a process has been set in place for the development of a water law for the country.

(ii) Issues / barriers / constraints to expanding access to potable water

5.10 *Delay in implementing agreed legal and regulatory framework.* The regulatory framework for the water sector is diffused and weak, and the roles of the various tiers of government unclear. Agencies of government have continued to see their role as service providers and as regulators. The new WRMS and the NWSSP envisage the creation of a National Water Commission – an independent regulator for water supply and water resources management in the country. Despite the acceptance of the imperative for an independent regulator, the agency has yet to be created. States were also expected to develop regulatory agencies to facilitate the achievement of sector objectives. So far, no state has an independent water regulator. Inadequate regulatory guidelines ensuring a level playing field for various categories of investors deter investment. Moreover, the activities of all tiers of government in water supply significantly overlap and are poorly coordinated.

5.11 *Pricing and financing of water.* The conception of water as a social good – free from nature and freely delivered by government may have created a basis for poor cost recovery. Inadequate revenue collection and low level of accountability has, among other things, undercut efforts to rapidly scale up access to water supply by state agencies. It has also provided a disincentive to investments in stand-alone water supply systems from boreholes. For states that have achieved some level of success in blocking the financial hemorrhage of unaccounted-for-water, the challenge will be to find financial vehicles to assist communities and private investors in new distribution concessions and in stand-alone systems. Properly designed subsidies, equity and loans are some of the vehicles that may be considered in developing financial support.

5.12 *Inadequate power supply.* UNICEF in partnership with State Governments has established a Rural Water Supply and Sanitation Agency (RUWASA) all over the country. Central to the strategy of RUWASA is the use of hand pumps – muscle power in pumping water. This is practical for many dispersed communities where the hydrological situation permits its use. However, for modern water supply schemes using water from deeper aquifers and serving more people, electricity is required. Power supply from NEPA, where such possibilities exist, is unreliable. Consequently, all water works in the country are planned with diesel generators as the main source of power supply. Depending on the size of the plant, the cost of diesel and maintenance of the generators constitute 30 -40% of total costs. This makes the cost of running modern water supply business greatly dependent on cost-effective and reliable power supply.

5.13 *Poorly directed subsidies.* Ten liters of potable water in a typical village will cost about N5 for raw borehole water. Meanwhile, the Abuja municipal Water Board supplies water to high income neighborhoods at the rate of N21/c^3 of treated water. This represents under half the cost of water in many rural areas.

5.14 *Regulatory impact restricts enterprise size.* The proportion of water supplied by individuals and companies represent a significant share of the total national output. However, for several regulatory reasons, there are no major water corporations. This has restricted water business to small scale enterprises and the informal sector.

5.15 *Local capacity to deliver rural water supply.* To a large extent, the competence, capital and technology to extract, treat and transport water exist in Nigeria. Several components are imported, including power equipment, rigs, pumps and some qualities of steel pipe. The service network for water supply is relatively well-established nationwide. Similarly, there are several procurement, construction and engineering consulting firms with strong presence in specific regions of the country. Due to the absence of major water utility firms, ownership and management experiences are limited to small scale firms and the informal water supply sector. While water engineering and procurement is big business in Nigeria, there is little domestic experience in running modern water and waste water utilities.

6

Expanding Access to Telecommunications Services

(i) Current status in telecoms access

6.1 The telecoms sector in Nigeria is fully liberalized. There are two national multi-service operators, namely the incumbent, NITEL and Globacom, the Second National Operator. The country now has four digital mobile operators, MTN, Econet, Glo (owned by Globacom) and Mtel (the mobile arm of NITEL). National and regional Fixed Wireless licenses have also been awarded. Several of them are in operation, particularly in the biggest cities. Today Nigeria is one of the fastest growing telecoms market in the world. Two years ago, the number of telephone lines was about 400,000. Today fixed lines and mobile connections are in excess of four million lines. The Federal Government has earned over one billion dollars in licensing fees.

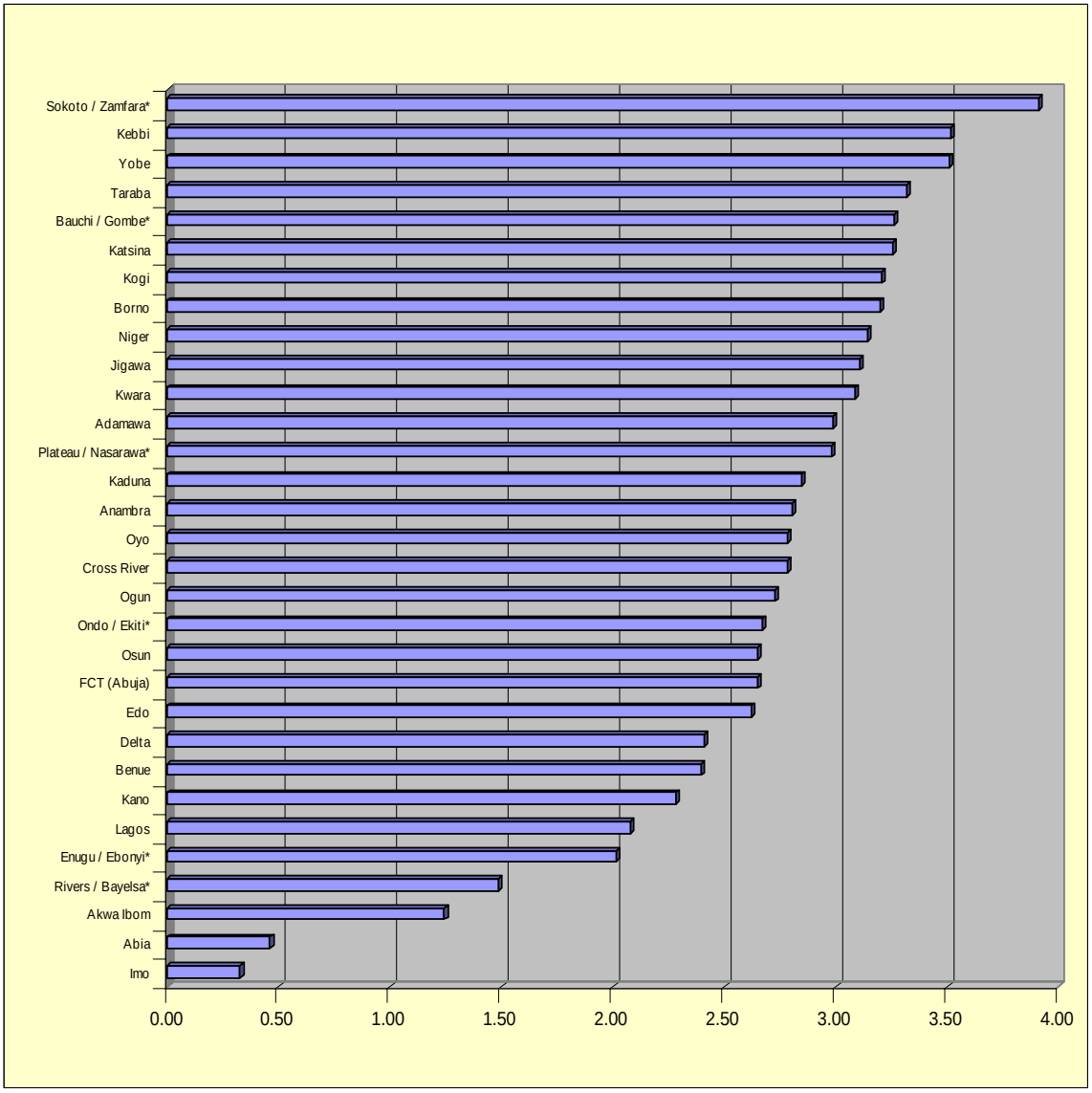
6.2 Currently, this success is essentially an urban phenomenon. The four digital mobile operators have concentrated their activities in high density areas. Locations without access are either remote or are relatively poor communities. This has therefore affected some regions more than others.

6.3 An NCC/World Bank study has looked at the market potential for telecoms services in the country. The study looked at a range of variables including geo-demographic, socio-economic and infrastructure data. It concludes that the entire country is reachable and that a significant market scope exists. The study conducted ranking among states. The most challenging northern states are typically low socio-economically. They have low revenue potentials, poorest infrastructure and highest cost for telecoms development. However some challenging southern states exist, but are less difficult to serve. These states usually are small in size; have potential to cover costs, and have good chances of returning a profit.

6.4 So far, digital mobile licensees have been slow in expanding into rural areas, despite the fact that the NCC requires them to invest part of their income in setting up services in the rural communities. Market assessments suggest that about 22 States will need some form of incentive to attract mobile operators. The Universal Access Fund

(UAF) operated by the stakeholders (Operators, Government and Donors) discussed below is expected to be a vehicle to deliver these incentives.

Figure 6.1: State Ranking for Telecoms Competitiveness



Source: Nigerian Communications Commission (2003)

6.5 In figure 6.1, high score means less endowed and less income per sq. km and therefore challenging for telecoms development. These southern states: Imo, Abia, Akwa Ibom, Rivers and Enugu are leading in terms of conditions for rapid telecoms development. Sokoto, Zamfara, Kebbi, Yobe and Taraba – all northern states, are the least accessible and will require significant effort to reach them.

6.6 The National Telecommunication Policy (NTP)[2] sets out a framework for the development of the sector as a key driver for economic growth. The policy seeks to make telecoms services universally accessible and cost-effective. In an effort to reduce the digital divide, the policy creates mechanisms to enable access by both the relatively poor and isolated communities.

6.7 In supporting universal access, the Federal Government commits itself to several regulatory and market initiatives including: a) open market entry in unserved areas; b) establishment of the USF; c) competitive license bidding based on investment commitments; d) outline of minimum rollout obligations; e) Community Telecenter development projects; f) public-private financing of infrastructure construction projects; and g) cross-sector investment and development projects.

6.8 The Communications Act 2003 clearly sets out the principles to be followed in support of the NCC in promoting networks & network services throughout the country. The Act establishes the USF to support NCC's activities to promote universal service. In pursuit of the Universal Service Provision (USP), NCC is expected to take the following steps:

- Liberalization of national licensing strategy to promote multiple operators at state level as well as national competition in fixed and GSM lines;
- Community consultations to develop a national universal access strategy;
- Introduction of community & local exchange licenses to enable local initiative; and
- Development of a pilot program for the universal service fund.

6.9 In collaboration with the NCC, the World Bank is currently conducting an assessment of the current status of the telecom sector, outlook and prospects for coverage of the country. The study seeks to "zone" the country to reflect regional challenges and size of program to achieve USP. It has also conducted a study to assess demand, preferences and affordability in urban, semi-urban and rural localities. Currently, the Bank is designing a Pilot Program and project to initiate the USP Fund, prepare USPF Operating Manual, bidding documents and licensing regime for USPF disbursements. The Bank will also assist in tendering and licensing of the first pilot project. The Universal Access Fund will be a key tool in meeting the needs of areas and segments of communities that are unlikely to be served by the market.

[2] National Telecommunications Policy (September 2000).

(ii) Issues / barriers / constraints to expanding access to telecommunications services

6.10 *Legal and regulatory issues.* The National Telecommunications Policy empowers the NCC to ensure that operators of licenses provide universal access to telecoms services nationwide. It provides enabling mechanisms, including the UAF to facilitate this process. Already, the operators are under pressure to improve quality of services, and bring down prices – which rank as some of the highest in the world. Meeting these expectations has proved difficult. Key regulatory barriers include the design of incentive structures to promote remote/rural access. The capacity of the national regulator to enforce compliance to regulatory provisions without compromising the integrity of the market for telecoms is a challenging issue.

6.11 *Financing.* According to an NCC/World Bank study, 22 states – most of them in the North will require some financial assistance to make them profitable for digital mobile coverage. Meanwhile the regional fixed wireless licenses are yet to be fully launched in most parts of the country due financing requirements. Access to finance seems to be the pivotal issue that must be addressed to realize a rapid scale-up.

6.12 *Inadequate power supply.* Reliable and cost-effective power supply is important to the rapid expansion of telecoms coverage. Due to the unreliability of electricity supply from NEPA, all major digital operators have had to power their base stations by using diesel generators. This has added to the cost of doing business, and has reduced the speed at which network expansion could have occurred.

7

Specific Examples: Case Studies

7.1 The following is a summary of pilot project concepts, some of which were developed during the Delta and Niger State workshops. They represent diverse proposals for ownership, operation and management, including State Government participation, community buy-in and private sector driven projects.

Gas engine embedded generation, Effurum Delta State

7.2 This is one of the pilot concepts identified and developed in a state-level workshop for Delta State. The concept seeks to use natural gas in the Niger Delta to produce power for a key national institution – the Petroleum Training Institute (PT1). Beyond the school, it also plans to provide electricity to communities around the institution. PTI has a population of about 2000 students and over 100 households providing services to the institution. This comes in addition to local communities surrounding the PTI. By using gas engine generators instead of turbines, the project promises to reduce upfront cost considerably (50% compared to gas turbines).[3]

7.3 The sponsors plan a scaleable delivery of 2.5 MW of electricity to PTI. Presently the school provides its own electricity using a diesel plant. The institution spends about N106 Million in energy services. Using gas engines and gas supplied through an already existing pipeline, the prospective investor (Sterling Oil & Gas Limited) offers to supply more reliable power services for N72 Million annually. The company proposes an initial delivery of 1 MW at a cost of USD562,500 to be financed with 40% equity contribution and 60% from the SMEIS program. In the absence of major regulatory and financial problems, this concept provides scalability, replicability and global environmental benefits by substituting diesel with gas.

7.4 This project is currently developing business and financial plans. A few make or break issues are yet to be cleared, and these include the following:

[3] Contacts have been established between the project promoters and Clarke/Jenbacher – a UK-based plant producers specializing in gas engine generators. While gas engines cost less to install, they require more frequent overall maintenance than turbines generators.

7.5 Gas delivery terms. One of the critical issues in the development of power generation projects in Nigeria today concerns access to gas. The market for gas has yet to be developed and harmonized. For instance, NGC sells gas to NEPA at the rate of USD0.12/mcf; other agencies of government: USD0.52/mcf; and industrial users at the rate of USD2.06/mcf. Direct negotiations between producers of gas and Nigeria Liquefied Natural Gas Company, River State IPP and industrial users were at the rate of USD0.31/mcf; USD0.45/mcf; and USD1.82/mcf respectively. Recently, the NGC has increased its prices for industrial users to about 100%. A stable and competitive organized market for gas is essential for the growth of power businesses such as GEEG.

7.6 Communal conflicts. The power station will be located within the premises of the PTI where the institute's security outfit will provide protection. However, this part of the state is generally unstable and conflict prone as ethnic groups confront each other and oil firms. This cloud of insecurity and unpredictability looming over the entire region will be a primary concern for potential financiers and investors.

7.7 Access to finance. Despite positive signals from banks, there is yet no clear and firm commitment to provide financing for this project. For the project to get off the drawing board, some form of financing in terms of loan and or equity is an imperative. Further, public institutions in Nigeria have a bad record in settling their bills, either due to low or late subventions from government. This creates significant uncertainties for the entrepreneur and other stakeholders in the project.

7.8 Commercial bank loans or equity investments are usually more demanding for start-ups – demanding greater documentation in terms of business plans, financial plans and credit history and other issues of due diligence. Secondly, some of the promoters as not well equipped to source funds from abroad, for instance in terms of opportunities for greenhouse gas reducing facilities. All these demand considerable capacity building.

Associated natural gas-based energy park pilot, Delta State

7.9 The concept is based on the use of associated natural gas that would otherwise have been flared at various flow stations near Sapele in Delta State. The idea is to deliver two energy products – electricity and methanol. It focuses entirely on power production in the initial phase with a scale up to include methanol during the second phase. The Sapele Energy Park (SEP) will primarily deliver power to industrial users and will explore sales of excess power to the national grid. These industrial users include a feed and flour mill, cement factories, roofing material plants, saw mills and food processing companies. It plans to produce 24 MW of power and 100T/day of methanol.

7.10 The methanol from the project will be used for household and institutional heating. A firm developing methanol stoves for household use in Nigeria will buy the product. The methanol component will interface with the ongoing Gaia Project in Delta State. Sponsors of the Gaia project are working towards the dissemination of methanol stoves for household use. The sponsor is currently carrying out an assessment of the various technological options. This will essentially determine the cost of the project. To

improve the chances of the energy park project succeeding, the following issues need to be addressed:

7.11 Gas delivery terms. The promoters plan to negotiate with the NGC and gas producers with operations near Sapele. Potential constraints are much the same as will be encountered by the GEEG project with gas market conditions dependent on ground rules outlined in the awaited gas policy. Competition for the flared gas, distance to flare stations, proximity to NGC pipelines and cost implications for gas producing companies are issues pertinent to the success of gas power plants in the region.

7.12 IPP terms/power sales agreement. A significant proportion of the power output of this project is expected to be sold to the national grid. While contacts have been established with NEPA, no agreement has been reached yet. It is also uncertain when the national power transmission company will be operative and on what terms power sales to the transmission monopoly will be.

7.13 Communal conflicts. Sapele has enjoyed relative peace compared to the general instability of that part of Delta State. However, the town hosts several petroleum related activities – usually a red cloth for conflicts in Niger Delta. How much this peace will endure is uncertain and will influence investment decisions by banks, potential investors and staff.

7.14 Access to financing. In addition to certain problems relating to funding start-ups, particularly in a challenging environment such as the Niger Delta, this project is likely to encounter other issues concerning its size, complexity and envisaged foreign currency component. Given present circumstances, raising USD40 for start-ups is demanding, particularly where a significant proportion is in foreign currency. Instability of the Naira posses significant foreign current risk.

Burutu-Forcados mini-grids (BFM), Delta State

7.15 The objective of this concept is to supply power to two remote communities in Delta State using associated gas from nearby flow stations. The pilot will supply power to households, factories and institutional consumers. BFM will be a private/public/community partnership to be owned by Delta State Government, SPDC and/or Agip, the Communities and the sponsor, Income Electrix Limited. The BFM will generate and sell electricity to Forcados and Burutu. The project will use 3 x 600 KW gas engines for Burutu and 120 KW gas engine for Forcados. The goal is to provide sustainable and cost effective electricity in Burutu and Forcados using associated gas from the Agip flow station, Obuguru where gas is currently being flared. Burutu has approx. 900 households and 9714 people, while Forcados has approx. 90 households and 900 people. The total cost of the project is about USD3 Million. The project plans to use flat rates for low-income households and metering for high income and institutional consumers. Institutional consumers include the Nigerian Ports Authority, Nigerdock, wood processing factories and a hospital. Power produced from this project will replace electricity from diesel.

7.16 Communal conflicts. This part of Delta State has known some form of communal violence between ethnic Ijaws and the Itsekiri. Poverty, ethnic rivalry and the presence of major oil firms as well as the policy of appeasement by both government and the firms make the Burutu-Forcados environment conflict prone. In a community where the population have a strong sense of entitlement and are not used to paying for public utilities, cost recovery will be challenging. Further, it will be a daunting task to convince a commercial bank to lend to such a project.

7.17 Other issues. Other issues key to the successful implementation of the project includes access to financing on non-commercial basis, an agreement with either the NGC or any of the oil majors for the supply of gas. To cut costs, it is imperative to design low cost connection options for many of the rural households.

Suleja and Mokwa water supply concession, Niger State

7.18 The Niger State Water Board intends to find innovative solutions to meeting the water needs of the citizens of the State. It plans to offer a concession for parts of Suleja and Mokwa LGAs for private sector rehabilitation and operation of the water works and distribution network. Suleja is a small commercial town of about 100,000 people. A willingness-to-pay survey indicated that 97% of respondents are willing to pay market price for water use. Mokwa is also a mixed community of about 15,000 people and has shown initiative and acceptance of private sector and community participation. Supply for Mokwa will be through ground water and might include rural electrification.

7.19 Ownership of the projects will be determined by open tender. Estimated project cost will about N100 Million. Financing could come through equity, bank financing and subsidy. The SWB is willing to explore various ownership proposals, from concessions to management contracts, and perhaps outright privatization in the long term.

7.20 Community acceptance. Many have traditionally viewed water as a social good, even when there is historical evidence that water has always come at some significant cost to families in Niger State. A key issue is therefore the ability to generate community buy-in for a commercialized water distribution networked backed by the State.

7.21 Political backing. In the new democratic environment, many politicians may see the commercialization of water as an electoral liability. The scheme is therefore likely to fail without the active support of the government. This is particularly important in Northern Nigeria where there is a strong tradition for strong government involvement in infrastructure provision.

7.22 Resource availability. Piloting water concessions are only possible where the resource base is accessible at reasonable costs. Deep aquifers combined with poor raw water quality increases costs and reduces the chances of success. Likewise a proper assessment of the surface water resource base for the Suleja water concession is also critical to the development of the pilot.

7.23 Access to financing. Developing private sector concessions for small town water supply networks is essentially an unmarked terrain in Nigeria. Attracting market based finance may therefore prove difficult. Designing appropriate financial solutions is therefore a clear make or break issue.

Rural electrification for Konkoso Village, Niger State

7.24 Konkoso is a border village, not connected to the national grid. The village has a population of approx. 500 people with about 100 households. The Niger State Rural Electrification Board had initially planned to develop a mini grid based on a diesel generator. However, the agency is open to use PV systems, provided they have cost advantages and provide reliable electricity to the village. A 500 KW diesel-based system is estimated to cost N30 Million while SHS will cost about N20 Million. The agency is open to developing business models to run either a mini-grid or stand alone renewable power supply to the village.

7.25 Selection of suitable investors will be by open tender. The Niger State REB commits itself to clarifying all make or break issues, seeking political backing for the project and preparing bid documents. The REB envisages a possibility for joint ownership between the agency, a firm and the community. Among factors that will influence successful outcomes for this pilot include the following:

7.26 Cost and financing. The final cost to consumers is at the core of such projects. It is important that rural electrification of this nature does not place new financial burdens on families. When changing from other sources to electricity, there should ideally be a small saving per household. A market survey establishing the present household expenditure on fossil fuels provides a guide. Such survey may need to include potential customer profiles including households, commercial, industrial and institutional potential customers.

7.27 Community acceptance and political backing. Many in Niger State – as in the rest of the country, pay little or nothing for power supplied by NEPA. Convincing communities and politicians that people are better off paying the full price for power consumed, and including perhaps the cost of connecting them could face challenging prospects.

7.28 Design – appropriate technology. The design of rural electrification projects for low income households in Nigeria has traditionally been costly. Gold plating of technical design results in high overall costs and poor chances of cost recovery and project sustainability. It is therefore imperative for sustainability that effective low cost designs are adopted.

7.29 Potential for combined service delivery. The chances of breaking even and making a significant return on investment is usually higher when rural power projects are combined with other economic activities. Sustainability and prospects for stimulating economic development may be compromised when the project only serves to “illuminate

poverty." Bringing in power as part of an integrated rural development package may make or break potential successes.

Small hydro-based water supply and community power supply schemes

7.30 A small hydro power project could be located in any identified potential sites in the country depending on access to the national grid and the presence of investors. The aim is to provide a private entrepreneur-driven supply of power for income generation in agriculture, local enterprises as well as community services. The project targets communities with 50 or more households, preferably with small, medium or large scale industries. Anticipated capacities of projects will be between 1 – 20 MW of power production, and could be stand-alone or grid-tied. The cost of projects will vary with size, technology and the particular resource situation.

7.31 The ECN in collaboration with UNIDO has identified 278 potential small hydro sites in the country.[4] To enhance the returns on projects and to increase social impacts, power supply will combine with water supply for domestic and agricultural purposes. Increased irrigation potential will enhance the productivity of farmers by enabling dry season farming. Investors could be identified by an open bidding process. However, in some situations, agriculture cooperatives modeled after the Fadama Water Consumers Association could be responsible for running the project. Potentially important challenges are as follows:

- Resource availability. Crucial to the implementation of a small hydro project is the quality of resource assessment. This includes among other things the availability, seasonality and competition from alternative uses of hydro resources in the area. An already well-know problem of current hydro plants in the country is the low yield during the dry season.
- Technical capacity. Experience with small hydro plants in Nigeria is not widespread. Currently the ECN in collaboration with UNIDO and a Chinese agency are working to develop interest in the area. Building the requisite technical manpower in addition to competence in running the project as a business is essential to realizing the potentials of the concept.
- Management. Currently, the proponents of the project are working mostly with official stakeholders (ECN, UNIDO and Ministry of Water Resources). It is not entirely clear which business delivery model the promoters favor (public, private, public-private partnership or community-driven approaches).

7.32 Other issues. Key to the success of this concept (and to all other business concepts) is existence of a viable market for the power generated. The existence of good load prospects in the rural area or possibilities for power sales will also assist in marketing the project for investment and financing.

[4] *Small Hydro Power Plants – A Solution to Power Supply in Nigeria* by Ayodele Afolabi Esan, Energy Commission of Nigeria (2003).

Combined village energy and water project

7.33 This concept is suitable for any village as remote from the grid as to make it unlikely that grid power will be available for the next five years. The concept is to provide a multi-purpose energy source. It is obvious that the provision of electricity on its own is unlikely to be affordable; however, it became clear at the Niger workshop that people in rural villages have cash and is prepared to invest it. Moreover, it appears that they are paying significant sums of money on potable water. Potable water can be made available using a borehole and PV power but this is also expensive and the power is very limited. In this idea, the diesel generator will be purchased by an entrepreneur (or a co-operative from the village or other suitable structure) and they will provide various services for cash. These services can include distribution of electricity, potable water from borehole or river using a filtration and a UV sterilization system powered by electricity, hot water from a waste heat boiler including ablution facilities, irrigation, crop processing etc.

7.34 Twenty or more households in the village will be required to make the project profitable. Capital and running costs will have to be minimized. One way of doing this is to use as much of the waste heat from the diesel generator as possible. This way more energy is available for the same fuel consumption and the diesel can be of smaller capacity. Another way is to use a generator with a higher voltage than normal. A good example would be an output of 1000 volts for a village with a processing load or a remote water pump in the river. The cost of distribution to various loads could be substantially reduced due to the higher voltage. It all depends on the local layout of the loads. Other issues specifically affecting the viability of the concept include:

- Technical Design. A normal rule of the thumb is to keep rural electrification technical designs simple and straight forward for many reasons including, operation and maintenance. The challenge is to design in such a way to reduce complexity in operation and maintenance by local people.
- Market for hot water. While the market for hot water is large in urban areas and more temperate regions, the situation in rural areas of Nigeria vary significantly. There are usually fewer applications such as bathing and uses in hotels and other institutions. Therefore, before hot water becomes a key component of the project cost, a demand survey needs to establish the potential market in a specific location.
- Access to Diesel. Perhaps the greatest challenge to diesel-power based rural electrification in Nigeria is a predictable access to diesel in rural communities. Not only is diesel costly in these areas, these commodities are sometimes scarce as a result of well-known national shortage of petroleum products. This may potentially lead to frequent and unscheduled outages and customer dissatisfaction.

Grid-based electricity distribution networks

7.35 NEPA is currently running a program on Revenue Cycle Management (RCM). The objective is to improve revenue collection by contracting this service to a private firm. Inbuilt incentives will facilitate performance by these companies. This concept seeks to extend the RCM concept into rural and semi-urban areas. Investors will be selected by open bidding. Successful companies will be required to own, operate and transfer concessions in specific communities. Licensees will purchase power in bulk from NEPA or the expected National Electricity Transmission Company (NETCO) at a metered point. Using existing distribution network in the area, the licensee will assume responsibility for power distribution, network maintenance and revenue collection. This concept could be applied within any grid connected location around the country. Among other potential barriers and constraints previously reviewed, this concept is particularly dependent on the following:

7.36 Predictable supply of bulk power. Current problems confronting grid-based rural electrification in Nigeria today are not only restricted to inefficiencies in the distribution networks; they also relate to the overall availability of power on the national grid and the efficiency of transmission infrastructure. The pressure to perform will expectedly be more on local distribution networks. Therefore an improvement in the overall availability and predictability of power coming from the national grid is important.

7.37 Capacity-building. Significant assistance in terms of training and other forms of capacity-building in technical designs, business development, marketing and customer relations are keys to successfully implementing the concept.

Stand-alone water entrepreneurship project

7.38 This concept seeks to develop a low cost mass market for franchises, family businesses or cooperatives in all locations that are not presently served. This will use borehole technology in extracting water in areas where the hydrogeological situation permits that. The borehole is equipped with a submisible pump, surface pump (or driven by electricity where the grid exists), overhead tank and dispensing outlets. Depending on the quality of the water, some treatment might be necessary. No reticulation is necessary.

7.39 The investor will drill, install and manage the water business. Depending on hydrogeological conditions and the depth of the borehole, projects could cost between N500,000 – N1,000,000. The total cost could be much less for hand pumps. This concept requires about 50 or more families to amortize the basic costs within 20 months.[5]

7.40 While this is already an established form of water business in many rural and semi-urban areas, it has great potentials for growth and impact if, among other things access to finance and public awareness initiatives are in place.

[5] The financial assessment is based on 30/l per person consumption, six-member family and N0.5/l cost. This cost may be lower depending on market situations.

School cyber cafés

7.41 The IT education policy of the Federal Government seeks to make all students of the country's secondary schools IT literate on completion of their studies. However, due to inadequate funding, the policy has not fully taken off across the country. Likewise, the chances of success are weak in the absence of electricity. Consequently access to internet has presently been restricted to urban areas.

7.42 This project seeks to develop a model for spreading IT competence, drawing inspiration from the traditional handicraft centers. School cafés will be established in central places within the LGAs. School children will be expected to spend one hour every week at the cyber centers. Rather than being owned by state governments as the handicraft centers were, the cyber cafés will be privately owned. State Secondary School Boards can subscribe for their students, while parents can pay for extra evening lessons.

7.43 The total cost of this pilot will be about N5 million. This is based on VSAT technology for a 20-workstation café with UPS, bandwidth subscription, 2 diesel generators, air conditioners, rent of space and payment for IT teachers. This pilot could be implemented in collaboration with State Government authorities. The following specific issues are relevant in developing viable businesses based on concept.

7.44 Political backing. State Secondary School Boards are in charge of education at the secondary school level. Curriculum changes and aspects of financing of this concept rests with these state-level agencies. Reaching an agreement with them – and by extension the support of the governor may be critical to the success of the pilot.

7.45 Public-private-parents partnership. Educational schemes of this nature affect most stakeholders in the community, particularly public agencies and families. Sustaining the scheme is likely to succeed where the private entrepreneur effectively partners with parents and state agencies, especially on issues of user fees.

7.46 Power supply. Running an effective delivery of IT services of this kind is dependent on a reliable source of power supply. Grid connected rural areas still would need a diesel generator back up, or could run a PV system if the available resources permit that.

Community telecentres

7.47 In collaboration with the World Bank, the NCC is in the process of developing a program on Universal Access to telecoms in Nigeria. The overall aim is to provide a cost-effective approach to delivering telecoms services to all parts of the country. The program is premised on the knowledge that some parts of the country will be less attractive for the major telecoms operators in the country, in terms of costs and expected rate of return. Therefore, it is proposing the development of a regional or inter-regional backbone to provide access to all operators willing to bid. There will be mandatory interconnection and tower access for all. Included in the program are local access networks, Internet POP and Internet public access along the routes reaching specified access targets to limits of wireless coverage from the route.

7.48 This project provides opportunities for smaller entrepreneurs to invest in village public access phones within standard or extended range of wireless base stations. This will typically provides services to 100 or more villages within range. Another product will be semi-urban or rural internet and business centers along the route of the backbone. Total costs will depend on scope.

7.49 Key issues that are essential to the success of the telecentres are the same as the school IT centers, but include in particular: capacity-building for rural entrepreneurs, enhanced access to finance and the availability of reliable sources of power supply.

8

Potentially Workable Approaches

8.1 The various pilot project concepts have encountered different barriers and constraints that challenge their full realization. Some of these challenges were discussed and analysed during the workshops for Delta and Niger States. The following is an overview of lessons learnt and potentially workable approaches in removing these barriers and constraints.

8.2 *Integrated approach to rural electrification.* The National Policy on Integrated Rural Development made a strong case for a holistic approach to infrastructure provision. Rural electrification needs to go beyond "illuminating poverty" to forming the basis for income generation and poverty reduction. Traditional supply-side argument for rural electrification in Nigeria is premised on its capacity to stimulate economic growth in local communities. While this might as well be so, it is increasingly accepted that rural electrification has better chances of increasing rural incomes and its own sustainability when it is proactively tied to economic and social value creation such as local industries, water supply and food processing, IT services and micro enterprise.

8.3 Three potentially valuable linkages are in water supply, IT services and the promotion of rural social services.

8.4 Linking rural electrification and water supply. The extraction of water, its treatment and transportation require significant amount of electrical energy. Agriculture and health are critical links between the two sectors. This is even more so when power is needed for irrigation as is the case in northern Nigeria. Presently, electricity for water supply purposes comes from diesel generators. However, solar energy, particularly in the North, is becoming a technology of choice for water pumping.

Table 8.1: PV Applications in Nigeria

Application	*% Proportion by Capacity*
Residential (mostly lighting)	6.9
Village Electrification & TV	3.9
Office/Commercial Lighting & Equip.	3.1
Street, Billboard, etc, Lighting	1.2
All Lighting	15.1
Industrial	0.4
Health Center/Clinic	8.7
Telecomm & Radio	23.6
Water Pumping	52.2
Total	100.0

Source: Energy Commission of Nigeria

8.5 In both Delta and Niger States, inadequate electricity supply accounts for nearly one half of all non-performing water works. The cost of running water works in the country is also very dependent on the power situation. Investors were more willing to consider investing in a water supply business when the power situation was stable. Access to power boosts water supply and in return income from water sales help sustain electricity businesses.

8.6 Linking rural electrification and community/educational IT centres. Educational institutions are major drivers for IT and telecoms services in rural areas. Electricity is particularly important for operating base stations, charging cell phone batteries and running internet and telecenters. In addition to education and communication, IT centres provide entertainment that may help stem urban migration by young people. Integrating IT concepts with rural power projects also help to create a market for electricity businesses.

8.7 Linking rural electrification and social goals. Health and educational authorities are worried that resources needed for the improvement of education and health often is diverted to providing infrastructure, such as roads, water and electricity. Well planned rural electrification linked to health and educational institutions tend to reduce energy costs that these institutions already incur. According to financial projections, the Petroleum Training Institute in Delta State will likely cut their power costs to over one third – nearly N40 million by accepting the package offered by one of the prospective project sponsors, Sterling Oil & Gas Limited.

8.8 *Local industries as anchor customers.* Conclusions reached at the Delta State workshop points to the fact that local industries are the best possible anchors for rural electrification. Both rural and urban industries suffer from high power costs and unstable supply. A system that offers lower cost and reliability by replacing in-house diesel generators will be preferred.

8.9 In the preliminary experiences of rural electrification investors in Delta State, bulk power sales anchored around productive load centers such as the Petroleum Training Institute, Nigerdock, NPA or industries such as wood and food processing factories tend to brighten up the balance sheets. Having a load anchor enables flexibility to expand electricity coverage and design "lifeline" tariffs for poorer households in the community.

8.10 *Low hanging fruits first.* In a country with a long history of a torturous electricity supply industry, cynicism and apathy about change is often the case. It is important to support projects that have good chances of quick gains. Giving priority to simple ideas with best chances of success encourages a rapid scale up and generates replicable lessons. It is therefore important to give priority to those projects that requires least support, have a ready market and least encumbered by community and institutional bottlenecks. The Bukuru-Forcados RE project is perhaps a good example of a high hanging fruit. The community is conflict-ridden, gas delivery terms are uncertain and the overall project cost is high.

8.11 *Supporting different approaches to accelerated service delivery.* The project concepts reviewed in both states have management approaches that range from potential private sector investments such as the gas engine embedded generation project to water concessions in Suleja Local Government and private-public-parents partnership for school IT centers. Diversity in approach ought to also include improvement in service delivery by incumbent public enterprises. Successes might not be determined by any one particular service delivery model, but by a combination of factors, not least the existence of a strong demand for electricity, water or IT services, the capacity to deliver and overall environment peculiar to the specific location and business.

8.12 *Community ownership.* Infrastructure projects should perhaps be owned by those with vital stake in their success. Community associations and cooperatives can be important vehicles in delivering services – sometimes in partnership with local authorities or the private sector. In volatile communities of the Niger Delta, community and state participation is an imperative – where the state provides a security guarantee while communities derive an incentive to ensure service delivery.

8.13 In the Burutu-Forcados project concept, the participation of the various ethnic communities is a make-or-break issue. Community participation can come in various forms – outright ownership by the community, counterpart funding, equity, in-kind contribution or other forms of acceptance and community goodwill. Supporting community participation will also assist in covering project financial gaps, promote security of installations and enhance their sustainability.

8.14 *Alternative and low cost technical designs.* Technical designs for rural electrification and semi-urban water supply have remained relatively intact since the colonial period. This has resulted in rigid, costly and consequently slow pace in expanding access. All the electrification and water projects reviewed in Delta and Niger states could benefit from more innovative technical solutions that reduce losses, enhance

quality and cost-effectiveness. For instance, the use of high voltage distribution system could reduce costs and improve voltage quality throughout the network.

8.15 *Supporting stakeholder dialogue and capacity-building*. Reform in the water and electricity sectors are at various preliminary stages. This has led to the lack of clarity and uncertainties about the regulatory environment and the emerging relationship between stakeholders. This has, for instance, given expression in doubts about gas delivery terms, IPP terms and the legal status of semi-urban water concession. When such doubts loom, it could lead to apprehensions and uncooperative attitudes by officials of incumbent public enterprises. Increased stakeholder dialogue, confidence and capacity-building are important steps in promoting reforms and supporting concrete infrastructure delivery initiatives.

8.16 Politics matters. Political considerations remain ubiquitous in most activities, particularly at the state level. An approach is to encourage more dialogue with political actors at all levels. The promise to provide infrastructure services by politicians is both a strong electoral item and the bases for scoring office holders. Political backing is therefore an imperative in building a consensus for a paradigm change on the delivery of infrastructure services.

Annex 1

List of Stakeholders Consulted and Documents Reviewed

Federal Government Agencies

Federal Ministry of Power and Steel

Energy Commission of Nigeria

National Electric Power Authority

Department of Rural Development, Federal Ministry of Agriculture and Rural Development

Federal Ministry of Water Resources

National Communications Commission

Petroleum Training Institute

Petroleum Technology Development Fund

Bureau for Public Enterprises

State Government Agencies

Delta State Ministry of Power and Energy

Delta State Ministry of Water Resources Development

Niger State Water Board

Upper Niger River Basin Development Authority, Minna

Niger State Rural Water Supply & Sanitation Agency

Private Sector

Niger State Chamber of Commerce, Industry, Mining and Agriculture

Income Electrix Ltd (Asaba, Port Harcourt& Lagos)

Sterling Oil & Gas Limited, Lagos

Univation Ltd, Effurum, Delta State

Business Systems Solutions Limited, Lagos

Wolfmetata Nig. Ltd, Asaba, Delta State

Project Gaia, Asaba Delta State

Union Bank, PLC, Minna

Niger State Rural Electrification Board, Minna

Shencko Associates Limited, Minna

Tee Ent. Nigeria Ltd., Minna

Wamadu Deve. Company Limited, Minna

Puma Eng. Ltd., Minna

News Engineering Limited, Minna

Banks and Financial Institutions

Afribank, Victoria Island

Diamond Bank, Victoria Island, Lagos

First Bank, Marina, Lagos

FSB International Bank, Ikoyi, Lagos

Oceanic Bank, Victoria Island, Lagos

Lift Above Poverty Organization (LAPO) – A micro finance institution

International Agencies

Department for International Development (British)

European Commission Delegation, Abuja

United Nations Industrial Development Organization, Abuja

World Bank Country Office, Abuja

List of Documents Reviewed

Draft Rural Energy Policy Paper (BPE)

National Energy Policy

National Electric Power Policy

National Policy on Integrated Rural Development

National Telecommunications Policy

National Rural Water Supply and Sanitation Program (Program)

National Water Supply and Sanitation Policy

Rural Development Sector Strategy

Water Resources Management Strategy

Federal Government of Nigeria (2001) Interim Poverty Reduction Strategy Paper (Draft)

Small Hydro Power Plants – A Solution to Power Supply in Nigeria by Ayodele Afolabi Esan, Energy Commission of Nigeria (2003).

Annex 2

List of Participants at the Delta and Niger State Workshops

Annex 2(a)

Participants' List for Delta State

NAME	ORGANIZATION	ADDRESS	TELEPHONE	FAX	EMAIL
Abba Mohammed A.	Federal Ministry of Power & Steel	Federal Secretariat, Abuja	08034533856		anwalabba@yahoo.com
Adebisi Ashimi	Univation Ltd	A2/10 Ughelli Road PTI staff Qtrs, PTI Effurun	053-257807, 08033502436		ext.ashimi@rgu.ac.uk
Akin Acetan	Federal Ministry of Water Resources	Area 1 Old Secretariat, Abuja	09 234 2734 080 33143487	234 2895	
Engr A.O. Mokwunye	Federal Ministry of Agriculture and Rural Development	Wuse Zone 5, P.M.B. 215, Abuja	09-5238463 09-5238469	09-5238464	
Engr L. K. Orekoya	Federal Ministry of Power and Steel	Federal Secretariat, Shehu Shagari Way, Abuja	080 23 25 33 23		
Engr T. O. Jinadu	NEPA	Rural Electrification Dept. NEPA Zonal Office, Zone 4 Wuse	080 44181800 080 33109285		
Engr. Felix Amrore	Income Electrix Limited		08023123500	084-232058	voltrac@yahoo.com
Engr. H.A. Akokhia	Petroleum Training Institute, Effurun	Petroleum Training Institute, Effurun, Delta State	08034026269		ext.ashimi@rgu.ac.uk
Engr. Joe Elueni	Min. of Power & Energy, Delta State	Min. of Power & Energy, Illa Dual Carriage Way, Asaba	08023302641 056-281 549		

Engr. M.B. Olowo	Federal Ministry of Power & Steel	Federal Secretariat, Abuja	08037003817s		
Engr. Mike Essien	Sterling Oil & Gas	2A Osborne Road, Ikoyi, Lagos	01-4820199 01-269 6053	01-269 6053	mikeessien@yahoo.com
Engr. O Matthew Edevbie	Income Electrix Ltd	6 Khana St. D/Line Port Harcourt	080 3740 2216 080 2311 6069 084 232058 084 232016	084 – 232058 084 – 232016	income@phca.linkserve.com
Engr. Sunday Edibo	Federal Ministry of Agriculture and Rural Development	Wuse Zone 5, P.M.B. 215, Abuja	09-523 8469 08035874712		
Ewah Otu Eleri	World Bank Consultant	Asokoro, Abuja	09 234 3836 080 2326 4045		eeleri@hotmail.com
Jamal Gore	Winrock International	1621 N. Kent St. N1200 Arlington VA 22209 USA	+44 1234 348471 +1 703 525 9430		jgore@winrock.org
James Agojo	Project Gaia (Energy Park)	Plot 28, Notie Ighile Ave, off Ekenwan Rd. Benin City	08023 37 12 61		agojojul@yahoo.com
James O. Emadoye	Business Systems Solutions Limited	6, Johnson Street, Off Coker Road, Ilupeju, Lagos, P.O.Box 5644, Surulere	01 493 8435		emadoyej@yahoo.com emadoyej@bsslnig.com bssl@cyberspace.net.ng
Joe Obueh	Project Gaia (Energy Park)	Plot 28, Notie Ighile Ave, off Ekenwan Rd. Benin City	080 23 3712 61		ceheen@eudoramail.com

Mac Cosgrove-Davies	World Bank		+1 202 473 3121	+1 202 473 5123	Mcosgrovedavies@worldbank.org
Munir Zubairu Sirajo	Petroleum Technology Development Fund	Plot 672, PH Crescent, Off Gimiya street, Area 11, Abuja	3142216	3142219	szmunir@yahoo.com
Samuel Udi	Min. of Power & Energy, Delta State	Min. of Power & Energy, Illa Dual Carriage Way, Asaba	08023007234 056-281 549		
Simon O Udeh	NEPA	Rural Electrification Sub-Sector NEPA HQ Maitama, Abuja	080 3313 8986 09 413 9632 (0)		
Stan Rerri	Sterling Oil & Gas	2A Osborne Road Ikoyi – Lagos	01 – 269 6053 080 3300 2585	01-269 6053	stanrerri@yahoo.com
Tata Messiri	Project Gaia (Energy Park)	10 Usonia Street, Off Nnebisi Road, Asaba	080 34 50 39 54 080 23 35 45 84		onataze@yahoo.com
Theo D. Oghoro	Min. of Power & Energy, Delta State	Min. of Power & Energy, Illa Dual Carriage Way, Asaba	08023358261 056-281 549		doghoro@yahoo.com doghoro@yahoo.com
Ugodo A. Sunny	Wolfmetata Nig. Ltd	P.O. Box 618 Warri	08037116925	053-257604	ugodoasunny@yahoo.com

Annex 2(b)

Participants' List for Niger State

NAME	ORGANIZATION	ADDRESS	TELEPHONE	FAX	EMAIL
O. Ajayi Esq	NCCIMA	Trade Fair Complex, Minna	066 223 153 066 221 451		
Adullahi Suleman	NCCIMA	Trade Fair Complex, Minna	066 224 223 066 224 221		Abdulsuleman@yahoo.com
Mamadu Zumara	Upper Niger River Basin Development Authority, Minna	066 224 923 066 224 869			
Hajia Farouk	Union Bank, PLC	Union Bank, Minna	066 221 285 066 222 115	066 222 115	
Ewah Otu Eleri	World Bank Consultant	Asokoro, Abuja	09 234 3836	09 234 3836	eeleri@hotmail.com
John Baker	World Bank	Washington DC	+1 703 704 1440		Jbaker@econone.com
Y. Usman	REB	Niger State Rural Electrification Board	066 221 394		

M. A. Evoti	REB	Niger State Rural Electrification Board	066 220 754		
Umar Idris	Shencko Associates	Minna	066 221 443		
Paul Garba	Tee Ent. Nigeria Ltd.	P.O.Box 3132, Minna	066 224 545	Same	
Mac Cosgrove-Davies	World Bank	Washington DC	202 473 3121	202 473 5123	
Matin Olowo	Fed. Ministry of Power & Steel	Abuja	09 523 1041		
Ambassador James Kolo (OFR)	Wamadu Deve. Company Limited	5 Zarumai Road, Minna	066 223 291 080 3452 1177	066 223 291	
Sani Ndanusa	Niger State Water Board	Nnamdi Azikiwe Road, P.MB 70 Western Bypass, Minna	066 224 853		
Yinka Agbola	Puma Eng. Ltd., Minna	No.3 Maduguri Road, Minna	066 220 855		

Hussaini Babani	Rural Water Supply & Sanitation Agency	Kpakungu Road, Minna	066 223 996		
Jimada A. Mohammed	Rural Water Supply & Sanitation Agency	Kpakungu Road, Minna	066 223 996		
Ibrahim Mohammed Idris	Niger State Water Board	Nnamdi Azikiwe Road, P.MB 70 Western Bypass, Minna	066 221 526 066 222 579		
U. A. Wchinko	NEPA HQ, Abuja	Office of the Chairman of NEPA Board	080 3314 0107 09 413 5504		
Engr S. O. Udeh	NEPA HQ, Abuja	Rural Electrification Sub-Sector, NEPA HQ, Abuja	09 413 9632 080 3313 8986 080 4418 3064	09 413 9632	udehsimon@yahoo.com
Engr. T.O. Jinadu	NEPA	Zonal Office, Wuse Zone 4, Abuja	080 4418 1800 080 3310 9285		
M. R. Jebbe	News Engineering	14 Paoko Road, Minna	066 223 166	066 221 550	

Annex 3

Report of Delta State Workshop

Report of the
Expanding Access to Rural Infrastructure
Mid-term Review Workshop for Delta State, Abuja, 24 July 2003
Organized by the Delta State Government in Collaboration with the World Bank
World Bank Country Office, Asokoro Abuja, 12.00 noon – 17.00

In attendance:

- Engr. Joe Elueni, Min. of Power & Energy, Delta State
- Samuel Udi, Min. of Power & Energy, Delta State
- Theo D. Oghoro, Min. of Power & Energy, Delta State
- Abba Mohammed A. Federal Ministry of Power & Steel
- Engr. M.B. Olowo, Federal Ministry of Power & Steel
- Engr. Sunday Edibo, Federal Ministry of Agriculture and Rural Development
- Engr A.O. Mokwunye, Federal Ministry of Agriculture and Rural Development
- Akin Acetan, Federal Ministry of Water Resources
- Engr T. O. Jinadu, NEPA
- Simon O Udeh, NEPA
- Engr. H.A. Akokhia, Petroleum Training Institute, Effurun
- Engr. O Matthew Edevbie, Income Electrix Limited
- Stan Rerri, Sterling Oil & Gas
- Engr. Mike Essien, Sterling Oil & Gas
- Tata Messiri, Project Gaia (Energy Park)
- Joe Obueh, Project Gaia (Energy Park)
- James Agojo, Project Gaia (Energy Park)

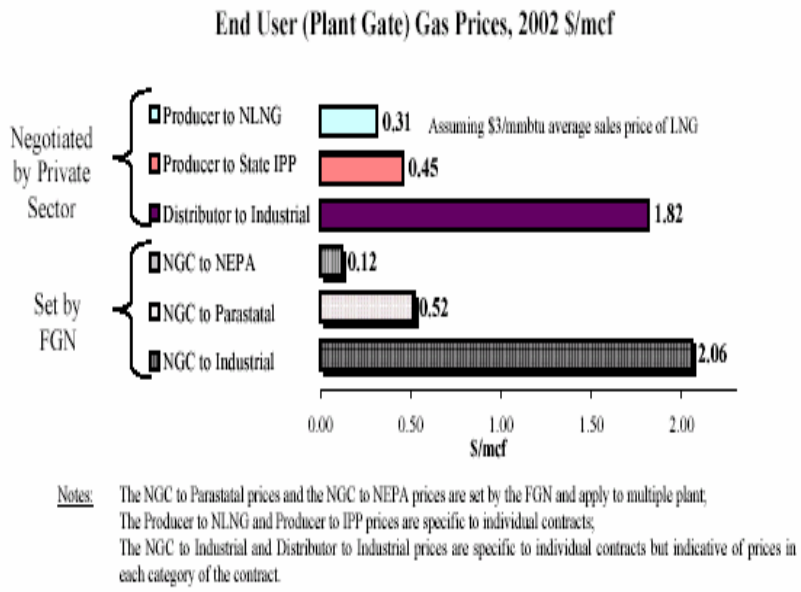
- Jamal Gore, Winrock International
- ***Mac Cosgrove Davies, World Bank (By Video Conference)***
- Ewah Otu Eleri, World Bank Consultant

Absent:

- Representatives of Bureau for Public Enterprises
- Representatives of the Delta State Water Board
- Representatives of Chevron (Invited by the Delta State Government)

Progress Report – Gas Engine Embedded Generation (GEEG), presented by Stan Rerri & Mike Essien, CEO, Sterling Oil and Gas

A3.1 Sterling Oil and Gas Limited conducted extensive consultations with various stakeholders with a view to clarifying key issues that should be resolved in the process of producing a viable and sustainable business plan. These issues, concerns and solutions are highlighted below:

1	Gas Delivery Terms, NGC and Gas Producers	Perhaps the most contentious issue in private or state owned power generation projects in Nigeria today, is the issue of access to gas. There is no law separating upstream gas from downstream gas and as such a confusing three-tier pricing regime exists. The Federal Government fixes the price of gas with a discriminatory policy that gives gas to government agencies at a much discounted price and private industries at a much higher price.  *Figure 1 Discriminatory End User Gas Prices* As the above chart shows NEPA gets gas at a much discounted rate and so do state parastatals and IPPs. Current grid IPPs like AES get gas at current NEPA rate (see chart) paid for by NEPA. Aggrekko and Geomatrix receive diesel fuel from NEPA for their IPP stations in Abuja. NEPA supplies the fuel and then buys the power. Interestingly, the new electricity reform policy states that generating companies will pay the commercial value of gas when NEPA is unbundled. Sterling Oil & Gas has carried out its project economic analysis and will make a profit generating electricity, using gas at current industrial and economically sustainable prices. Sterling Oil Gas can generate power in a revolutionary package, which includes cost of gas, gas engine, maintenance, financing and guarantees for N9.00 per kw/hr. NGC has conveyed their willingness to supply gas and price talks are on going.
2	IPP terms	The present law clearly states that any regulation of off-grid power generation lies with the State government. No regulatory or licensing regime presently exists in Delta state. NEPA and the Ministry of Power & Steel have stated repeatedly that they will hands off off-grid private power transactions. The Nigerian Constitution, Electricity Policy and Draft Legislation are clear on this.

3	Tariff regime	Current NEPA tariff is N10.00 per kw/h, RUC is N9.00 per kw /h. 10% less than NEPA.
4	Civil unrest/ vandalization	The power station will be located within the PTI premises and so with other facilities in the college will be protected by security. A reputable insurance company will also insure the station.
5	Financial Analysis	Revenue for first year based on the electricity demand forecast is N46,863,000 while net profit is N3,030,000. We expect to make N11,500,000 net profit in year two with operating cost of N25,000,000 in year one. A loan of N42,863,000 is required to complement equity of N28,000,000 for the purchase and installation of phase one gas engine. A fixed repayment of N1,550,000 is planned for 36 months at 18% interest rate. Dollar to Naira is assumed at $1/N127. Sterling Oil & Gas expects to obtain local currency financing from a local Bank with the World Bank acting as a collaborative partner in clarifying regulatory, financial, institutional and resource issues. Sterling Oil & Gas envisages a loan repayment period of three years and a project payback period of four years. Custom duty, VAT exemptions and tax holidays are mandatory because project utilizes natural gas.
6	Technical Design	Due to the requirement of PTI, a phased approach has been adopted of 1MW for each phase. This modular design will increase its capacity as and at when PTI upgrades its facility or acquires more load.
7	Management and administrative arrangements	Sterling Oil & Gas will provide operations and maintenance services for the plant backed by Clarke/Jenbacher engineers. The plant will have 2 project managers, 6 shift operators, 3 engineers, 2 drivers and 3 administrative staff.
8	Competitiveness of selected investment-yardsticks	Project provides an alternative to NEPA and present standby facilities. GEEG is 10% cheaper than NEPA and offers reliable and uninterrupted power.
9	Synchronous generation with NEPA	Project envisages relegating NEPA to standby mode and may be used for short periods during planned maintenance.
10	Establishing community buy-in	30% of Sterling Oil & Gas is being offered for subscription to local community groups.
11	Legal approval	Project falls within the limits of the laws governing business transactions in Nigeria
12	Replicability of project	This project can be implemented any where in the world where there is flared gas, piped gas and/or expensive electricity transmission infrastructure issues or terrain difficulties.
13	Reliability / back up	The gas engine manufacturers General Electric Jenbacher have a proven reliability record. Project provides for a diesel driven generator as back up.

Risk Management

Risk	*Responsibility*	*Mitigation*
• Gas supply	NGC	Financial Penalties/NGC
• Stranded assets	Sterling Oil & Gas	Fixed term Contract/PTI
• Political	Sterling Oil & Gas	Study of precedent
• Interest rate	Sterling Oil & Gas	Fixed interest rate
• Credit	Sterling Oil & Gas	Bank guarantee/PTI

Comments

- *Funding:* More consultation may be required in expanding the search for innovative financial mechanisms for the project. While the cost of short term funds in Nigeria may be prohibitive, specific facilities such as the Small and Medium Enterprises Investment Scheme (SMEIS) could present one of such options. External borrowing exposes the investment to currency risks. However, several international development funds exist that could provide terms that mitigate this concern.
- *Total costs to PTI*: It is important to properly assess the capacity of the costumer to meet the expected annual expenditure. From the financial analysis, PTI is expected to spend N47 million on less than half of its overall energy requirement. This may call for a solid analysis of the ability-to-pay profile of the institution.
- *Relationship to NEPA* – Envisaged use of NEPA and existing PTI diesel generators may demand closer analysis of costs and contractual relationship with all the parties involved.

Next Steps

A3.2 This project needs to focus on clarifying potential funding sources. Update on funding is expected at the next meeting.

Project 2: Gas Turbine and Local Distribution Network for Communities – Progress Report on Key Issues, Risks and Mitigation, Sponsored by Income Electrix Limited

A3.3 Income Electrix Limited commissioned an extensive survey to provide the database upon which to develop business plans for rural electrification projects using gas turbines in Burutu and Warri South Local Government Areas of Delta State. These surveys have focused on the following areas:

- Geographic survey of the target areas to establish the proximity of gas sources to the communities.

- Demographic and socio-economic surveys of the target communities to help in establishing their potential electricity demand, willingness and ability to pay and current energy use.
- Technology survey of various types of mini and micro turbines to ascertain the suitability of the various options.
- Consultations with potential key stakeholders, including oil and gas operators, the Delta State Government and target communities. This segment sought to determine the willingness of the various stakeholders to participate in the project.

1	Gas Delivery Terms	Survey conducted by the company has shown that the Escravos – Lagos gas pipeline runs close to the targeted communities (ethnic Ijaws and Itsekiri communities and towns). The company will explore the possibility of Chevron providing associated natural gas from their flow station as well as the possibility of using dry gas from the NGC gas pipelines.
2	IPP terms	IPP terms are not applicable as project is mini-grid electrification, detached from the national grid.
3	Tariff regime	This shall be determined after putting together all the cost, determining loan repayment terms and breakeven points.
4	Civil unrest/ vandalization	The company intends to involve communities in ownership and operation and thus committing them to protecting the investment.
5	Financial Analysis	A financial analysis is yet to be done.
6	Technical Design/ Connection Costs	Technical design is in progress and will allow the possibilities of using low cost option. Very low cost options and designs shall be chosen both for the plant, the gas transportation system and the distribution lines.
7	Management and administrative arrangements	This is being designed.
8	Competitiveness of selected investment-yardsticks	The socio-economic survey conducted by the company has shown that households already spend a lot of money on energy services. The objective is to provide services that competitive in terms of quality and prices than current options.
9	Synchronous generation with NEPA	The issue of synchronous generation with NEPA does not arise as grid tie with the national power company is not envisaged.
10	Establishing community buy-in/Community Development Plans	This is an ongoing process. We are proposing micro-credit for feasibility studies and SME's from state Government and the Oil companies to encourage income generating activities and thus improve ability to pay of the rural consumers.
11	Legal approval	The electricity act permits state participation in off-grid electrification. Since the Delta State Government is a part owner, legality has been established. We however propose that the state put in place a state regulatory framework or sign an M.O.U with the company.
12	Replicability of project	This project has good chances of being replicated provided a sound business plan and operating environment is developed.
13	Reliability / back up	A very reliable technology shall be chosen, however we intend to keep the existing local generators as back-up.

14	Subsidy level, sources and what is being subsidized	We propose custom duty, VAT and withholding tax exemption or reduction on cap ital equipment and contracts. We propose that access be subsidized by oil and gas operato/government by providing gas transportation facility and power generation facility. We also propose that community equity be subsidized 100% by international donors, oil and gas operations and the Delta State Government.
15	Tariff (including indexing)	Shall definitely be lower than current energy expenditure, but cannot guarantee at this stage if it shall be less than, equal to or greater than NEPA tariff.
16	Rural Consumption	We shall establish this when we analyze our demographic and socio-economic survey reports
17	Operation and maintenance costs	Operation and maintenance cost to be covered by revenue.
18	Danger of stranded assets	This is being mitigated against by the ownership strategy and we also propose international insurance cover.
19	Danger of Currency Risks	There is a major currency risk as capital equipment and possibly some loan shall be in foreign currency, while revenue is in Naira. This issue will be addressed in the financial plan.
20	Off grid solutions	The possibility looks good as active stakeholders, oil companies are expected to facilitate access to flared gas.

Sorting out stakeholders – defining roles

A3.4 Income Electrix proposes the following roles for various stakeholders:

1	Income Electrix Limited	Provide equity contribution Build, operate and manage system Collect in partnership with the community, the revenue
2	Community	Provide equity contribution Collect revenue under supervision of Income Electrix Limited Provide land for plant and right of way for line Provide and guarantee peace and conducive atmosphere for the operation
3	Delta State Government	Provide equity contribution In partnership with Chevron, provide the distribution facility and gas transportation facility Provide and guarantee peace Guarantee minimum revenue Provide micro-credit to households in the community Fund the feasibility study
4	CHEVRON	Facilitate inter government negotiations Provide Gas for a concessionary fee Provide equity contribution In partnership with Delta state Government, provide distribution

		facility and Gas transportation facility Guarantee minimum revenue Provide micro-credit to community dwellers in Partnership with NGO's for usage on energy related business Fund feasibility studies for energy utilization for the community dwellers-[small/medium scale enterprises
5	World Bank	Co-ordinate and direct pilot project plan Leverage International financing Guarantee Investment Share experience on best practices Assist in getting Federal Government of Nigeria to approve fiscal subsides Leverage grant from international donor

Comments

- *Technology Choice:* Gas turbines though robust in terms of operation and maintenance tend to be costly compared to other options, especially gas engines. Turbines cost about double the cost of gas engines. These are issues that need more consideration.
- *Community Relations:* The investment must find approaches to dealing with the overall violence and volatility of the Niger Delta. A sustainable approach is called for; community acceptability is therefore a make-or-break issue for the project. An approach is to actively seek community buy-in. The community may contribute in provides services, especially labour, may be responsible for collecting revenue and providing security.
- *Moral Hazard:* The presentation envisages a guarantee of minimum income from other stakeholders. This diminishes expected risk, but raises a significant chance of moral hazard if revenue is guaranteed, irrespective of sales or disruptions. This may at least result to difficulties among stakeholders in the project.

Next Steps

- Analysis of the surveys conducted.
- Further discussions with various stakeholders.
- Develop a business plan.

Project 3: Sapele Energy Park Project – Progress Report on Key Issues, risks and Mitigation by Sponsored by Stokes Consulting Group

Project Description

A3.5 This presentation is a proposal for the production of a range of energy products – LPG, electricity and methanol – from associated natural gas. Associated gas will come from the Sapele flow station and processed at a nearby site on the bank of the Ethiope River and about 2 kilometers from the flow station.

A3.6 Associated gas would first be processed and stripped of LPG and NGL, which may be sold to LPG refillers and solvent and paint manufacturers. The project plans to separate dry gas into two streams: one stream to produce power using a gas engine while the other stream for methanol production.

A3.7 LPG would be sold to owners of LPG refilling stations. These potential buyers already possess the infrastructure for LPG collection and trucking but have had inadequate supplies from the country's dilapidating refineries. NGL on the other hand will find a market among paint manufacturers and solvent distillers. Power may be sold to NEPA and methanol to the Nigerian affiliate of Dometic AB.

A3.8 The project sponsors conducted extensive consultations with the local business community, the local government, the State Government, plant and equipment manufacturers, NEPA and Dometic AB. A SWOT and PEST analysis has also been carried out.

A3.9 The associated natural gas input is 7MMscfd (250 MNm3/day) while the outputs are 17m3/day of NGL, 95m3/day of LPG, 100 tonnes/day of methanol and 12MW per day of electricity. Financial analysis is based on US$40 million capital cost financed on 30% equity and 70% long term loan basis. Return on equity is assumed at 30% per annum before tax. Loan interest is 4% per annum payable over 15 years.

A3.10 Several issues are outstanding including cost and access to associated gas from NGC, relationship with NEPA, discussions with LPG refillers and paint manufacturers, long term contract terms with methanol stove manufacturer – Dometic AB. Other issues are legal and regulatory framework, financing of a detailed feasibility study and available long term financing terms for the project.

Key Issues

1	Gas Delivery Terms (Cost/m^3) to be negotiated with NGC. There is need to explore current Federal Government policy on the sale of gas. Can/will the government subsidize gas for power generation?	Assumed at $0.25/mscf for untreated, associated natural gas at flare site. Assumption is based on IPA energy market diagnosis report, Nov. 2002. Negotiations to be entered into with NGC. Letter of introduction from World Bank required.
2	IPP Terms/ Power Sales agreement (negotiated with NEPA)	Informal contacts made with Benin District of NEPA. Power likely to be put into NEPA grid at 33KV which would ensure that distribution would be to the Sapele and the surrounding rural area. Proposed sales of power at $0.05/kw-hr is lower than present IPP agreements. However, IPP terms yet to be negotiated. Letter of introduction from World Bank required.
3	Civil Unrest/Vandalisation – mitigation, prevention and responsibility for repairs	Sapele has consistently won the SPDC peace award for its operational areas, so the area is considered peaceful. However, the local government and business community are being courted and the intention is that they would be shareholders in the project. Also will try to get insurance cover from MIGA to attract foreign investors.
4	Financial Analysis	Financial analysis carried out based on 30% equity, 70% loan. Conditions of loan assumed to be 4% p.a. payable over 15 years. Returns on equity assumed at 30% p.a. before tax.
5	Technical Design/minimize costs	Detailed engineering design and feasibility studies required. To discuss with World Bank and Delta State Government the possibility of leveraging some grants towards commissioning a detailed techno-economic feasibility studies.
6	Competitiveness of selected investment – yardsticks	Power – NEPA is unable to supply ample power to Sapele and its environs; the proposed sales at $0.05/kw-hr is lower than any present IPP or EPP agreement.
7	Consumption levels	Consumption levels include that by major industries encompassing feed and flour mills, cement factories, roofing materials, saw mills with auto generation; diesel engine powered grinders and graters for cassava; wood and cassava dryers etc. Electricity consumption in the area is well over the 12MW being generated.
8	Currency risks	All products are priced in dollars. The prices being charged presently are much lower than prevailing market prices but will be adjusted at equivalent naira value. Alternative supply for LPG and methanol are imports including freight and import duties which would be in dollars and more expensive.
9	Operations and	It is assumed and will be negotiated with plant and

	maintenance	equipment manufacturer for a 2-year operations and maintenance contract.
10	Replicability of project	The project is replicable because any location close to a concentration of population and an oilfield with associated flared gas can have a similar facility.
11	What components of the energy park can be left for a second phase?	The gas processing plant for LPG and NGL as well as the power plant can be taken in phase 1. It would be necessary to ensure that there is no natural gas sent to flare. A financial analysis will be run to check if this would be sustainable.

Comments

A3.11 *Contracting arrangement and scalability:* The project envisages several contracting arrangements and product range. This could result in complexity and significant challenges. Therefore, if the project is scalable, an incremental project development process could be an option. This will provide opportunities to move forward with an LPG plant, or power generation as the case may be. In the incremental approach, it is important to plan the utilization of residual resources such as dry gas, in case of an LPG plant.

A3.12 *Relationship to the National Grid:* Sapele is already served by the national grid. It is important to properly assess the market for power produced in the area. Will NEPA or a potential distribution company guarantee bulk power purchase, and at a profitable rate?

Next Steps

- Negotiations between Delta State and NEPA to have the entire portion of power purchased by NEPA dedicated to the Sapele and her environs in the event that the envisaged Distribution Company (a future spin-off from NEPA) is not in place by the commencement of transmission of power by the Sapele Energy Park.
- Discussions with Nigerian Gas Company (NGC) on gas prices and opportunities for equity partnership are ongoing.
- Consultations with various stakeholders, including World Bank, International Oil Companies, Delta State Government, etc. to bolster support for the introduction of methanol as an alternative to fuel wood.
- Discussions with Dometic and HydroChem for private sector participation in the energy park.
- Discussions with World Bank on leveraging 70% loan portion at 4% per annum repayable over 15years.
- Discussions on the possibility of MIGA providing insurance against civil unrest, appropriation, foreign currency risk, etc. to attract foreign investment.

- Approach to oil companies to know their requirements of methanol for offshore oil drilling operations and other uses.
- Engineering and feasibility studies to narrow uncertainty in investment and profitability analysis to less than 10%. Finance from Project Preparation Facility loans or Delta State Grants-in-aid.
- Involvement of Niger Delta Development Commission.

Project 4: IT Education for Secondary Schools and Community Internet Access by Mr. Samuel Udi, Director, Delta State Ministry of Power and Energy

A3.13 The concept for the IT project is currently being developed. A potential investor has indicated interest in developing the concept. The Delta State government envisages a pilot project to be sited in Isoko North Local Government. There are 17 secondary schools and two institutions of higher learning in the area.

A3.14 Several options will be explored in the pilot phase of the project. This includes a programme where the State Government buys IT equipment and recruits private operators to run it, or a system where investors equip and run IT centers. In the latter, the government will pay the private operator according to the number of students using the centre.

Comments

A3.15 This project concept needs to be fleshed out significantly. It requires a model that is private sector-led, sustainable and effective in delivering IT education. The primary focus must be in testing out business models are that are replicable.

Next Steps

- Prepare a business plan.
- Provide more detailed project description.
- Determine if the project concept should inclusion rural telephony.
- Identify the role of community.
- Clarify the various roles of stakeholders.

Next Steps for all Projects:

- Outputs should be ready for presentation at the next Power Sector Reform Leaders Meeting, Sept 10-12.
- The next project review meeting is scheduled for Wednesday September 03.

Annex 4

Report of Niger State Workshop

Report of the
Rural Infrastructure Development in Water, Power, & Telecommunication
Workshop for Niger State, 19 June 2003
Organized by the Niger State Water Board in Collaboration with the World Bank
Venue: Niger State Chamber of Commerce and Industries, Trade Fair Complex, Minna

Opening Remarks by the Mr. O. Ajayi, President, Niger Chamber of Commerce, Industries, Mines and Agriculture

A4.1 Mr. Ajayi extended his appreciation for the partnership between the World Bank, the Niger State Government and the Chamber of Commerce, Industries, Mines and Agriculture. The mission of the Chamber is to promote private sector investment in the State. Members are engaged in various sectors of the State economy. The Chamber will mobilize its resources to create an enabling environment and opportunities for private sector participation. This workshop is an important step in this direction, and the report will form the basis for a presentation to the Council of the Chamber.

Presentation by Engr Sani Ndanusa, General Manager, Niger State Water Board

A4.2 In accordance with the goals of the National Policy on Water Supply and Sanitation, the Niger State Water Board seeks to extend safe and adequate water supply throughout the state. Progress is however slow due to several known constraints. Some of these constraints include the competing value of water as both social and economic good. Political considerations in the allocation of projects also present significant challenges. It is within this context, that we welcome this new initiative.

A4.3 The Water Board is committed to creating an enabling environment and providing supportive measures for private sector and community participation in rural water supply. The Board believes that some specific parts of the State can be supportive of private sector investments. Therefore it is committed to engaging with the World Bank to develop a carefully designed plan for the start up of pilot projects. Engr Ndanusa noted that these projects have to be in form of public-private partnership, and must have the acceptance of the host communities.

A4.4 Expanding Private Sector Investment in Rural Infrastructure – A Conceptual Framework, Mac Cosgrove-Davis, World Bank

A4.5 The World Bank appreciates the growing consensus on reforming the provision of rural infrastructure to improve access to the poor. While many lessons can be drawn from similar activities around the world, it is important to find solutions that address Nigeria's specific problems. As polices are developed, it is important to keep our feet on the ground. The World Bank is supportive of a two-track approach – supporting policy reforms and facilitating pilot projects that test the robustness of the reforms. The primary objective of these pilots will be to generate replicable models of expanding access to rural areas.

A4.6 Together with the stakeholders in Niger State, the World Bank is interested in developing pilot projects – piloting business models for private sector and community participation in infrastructure development. It is important that projects are developed within an open architecture – where different stakeholders, including all levels of government, the private sector, communities and NGOs can sponsor models that commercializes water, energy and telecom services. The World Bank will partner with key stakeholders in their efforts to develop these models and create new and innovative approaches to expanding access to infrastructure.

Comments by John Baker, World Bank Consultant

A4.7 International best practices today suggest that access to rural electricity alone will not be sustainable and may come at a great cost if not mainstreamed as an integrated rural development package – with other social and economic activities.

A4.8 Recent initiatives in rural electrification, linking payments of subsidies to outputs have been delivering better results than traditional approaches. By using smart subsidies, sharpening incentives for operational efficiency, and mobilizing private investment recent initiatives in form of output based contracting can boost consumer access, and cut funding costs and performance risks for both taxpayers and donors.

A4.9 In several of the success schemes, subsidies have been delivered as capital grants for extending or creating an isolated grid or installing renewable energy. Most grants have partially funded investment, but not consumption. The grants can be provided as one-time payments (as in Chile) or paid for the completion of specific investments (as in Argentina and Panama).

A4.10 The key issue is whether projects will be financially viable (with subsidies) – whether the communities will have sufficient demand and have the ability to pay tariffs to cover operation and maintenance costs. A particularly effective approach in countries such as those mentioned above and including the Philippines and Bangladesh is to emphasize the contribution – especially the financial contribution – to be made by local sponsors, subject communities/cooperatives, private companies and other NGOs.

A4.11 There is strong evidence to date that subsidies should be directed towards access to electricity rather than consumption. Investment subsidies can directly link the disbursement of aid to the most important output indicators – the number of newly electrified villages or new households connected.

Comments by Ian Davies, World Bank Consultant

A4.12 Rural electrification that pays for itself is possible and affordable. Rural people can afford to pay, because they are already spending some amount of their income on energy. New RE projects should not place new financial burdens on families. If electricity is marketed at the correct price there should be a small saving per household when changing to electricity. As a matter of urgency, a market survey should be conducted to establish the present household expenditure on fossil fuels.

A4.13 It is also important to have a clear strategy, especially a financial model. This tool provides a road map to the future and clarifies the extent of sustainability. Key issues related to a successful RE project include minimizing the cost of money, operating costs, construction costs, technical and non-technical losses and maximizing community involvement and support, revenue collection, payment levels and skillful marketing of electricity. Other factors that need to be carefully considered are; affordability, consumption levels (consumption above 200kWh/m may be critical for sustainability), the danger of stranded assets and currency risk.

Discussions

Ambassador James Kolo

A4.14 Ambassador Kolo suggested that baseline issues regarding the state be first analyzed. These issues include the high level of poverty; the role of government; and the perception by people of the state that social amenities are free of costs. These and many more are key issues that need to be addressed in the effort to assist the development of new initiatives. To ensure success, several public awareness activities are needed.

Representative of the Upper Niger River Basin Development Authority

A4.15 Political interference in service provision is a major problem. Sometimes irrigation schemes are awarded where the resource base does not allow it. Secondly, poverty and the perception that government services are free make service provision difficult.

Abdullahi Suleman, IT Businessman

A4.16 Part of the unwillingness to pay for services maybe traceable to the lack of confidence that public money will be spent wisely. Two, government revenue is not always committed to providing incentives for further developing the particular sector that generates the revenue. The case of money from digital mobile phone license sales is an example of financial management that fails to stimulate sectoral development. To facilitate willingness to pay, a lot of confidence building measures must take place.

Engr. Hussaini Babanne, General Manager, Rural Water Supply and Sanitation Agency

A4.17 Traditionally, policies have been top-down oriented. We have to increasingly think of ways to involve and empower communities to be partners in providing, securing and sustaining projects. Community mobilization and ownership are critical to success. This is the lesson that RWSSA has learnt in the several years of working with UNICEF in providing water and sanitation services to local communities.

Mr. O. Ajayi, President of NCCIMA

A4.18 We should stop thinking that rural communities are so poor that they cannot afford to pay for services. They can. We therefore need to rethink, and evolve ways to stimulate private sector participation. Two, we need to expand the scope for private sector participation to include road construction and maintenance.

Engr. Yamman Usman, General Manager, Rural Electrification Board (REB)

A4.19 The REB has connected 260 communities in four years. As part of the national RE program, 32 of 42 LGA headquarters in the state are covered. Counterpart contribution is expected from various stakeholders, in the order of 70%, 20% and 10% for the state, LGA and communities, respectively. Meters are supplied free of charge courtesy of the Niger State government. The State Government also pays consumption charges for the first three months of connection.

Hadjia Farouk, United Bank for Africa

A4.20 Financial institutions are willing to support efforts to boost rural infrastructure. However, there is a need to have clear and bankable business plans. UBA sees a lot of business prospects in rural areas and will be committed to creating financial opportunities for business.

Representative, Federal Ministry of Power & Steel

A4.21 It is the primary responsibility of the Federal Ministry of Power and Steel to provide electricity for Nigeria's rural areas. The state has been a key partner in this process. However, the cost of universal coverage is enormous. Other actors, especially the private sector must participate in a new resolve to develop strategies for expanding access.

Presentation of Project Proposals

Water Supply

Description

1. Private sector supply of water to Suleja and Mokwa LGAs. Suleja is a small town with an ethnic mix that includes a lot of enterprising people. A willingness-to-pay survey gave a high figure of 97% that are willing to pay for water use. Mokwa is also a mixed community and has shown initiative and

acceptance of private sector and community participation. Supply for Mokwa will be through ground water supply.

- Private operation of existing water works in a ring-fenced part of the town.
- Concession/ownership including refurbishment.
- Possibility to combine with rural electrification for the case of Mokwa.

Project Sponsor

Open tender – there are some potentially interested sponsors

Size/Scale

Size: 5 – 15,000 people

Cost: 50 – 100 Million Naira

Financing

Equity

Bank financing

Subsidy

Issues

- Perception that government must provide services for free
- Legal framework
- Community acceptance
- Market Survey
- Opportunities for expansion (raw water source)
- Local distribution options
- Appropriate and sustainable technology (use of gravity, etc..)
- Minimize capital & operating costs
- Quality of raw water
- Political backing
- Define role of stakeholders (Government, Private Sector, Communities, etc.)

Make or Break Issues

- Community acceptance
- Water availability (resource constraints)
- Political backing

Initial Sponsor

Niger State Water Board

Road Map:

i. 18 July (4weeks) First Inception Report with a tentative draft proposal. GM will bring in some potential sponsors. One has already signified interest.
ii. Call for Expression of Interest
iii. Develop bid package
iv. Bidders Conference
v. Evaluate, Shortlist & Award

Rural Electrification for Konkoso Village

Description

Konkoso is a border village, not connected to the national grid. It is a new site, not previously electrified.

Size

The population of Konkoso is approximately 500 people and 100 households.

Capacity – 500 KVA diesel generating set

Cost: about N30M

Sponsor

Open tender

Issues

- Design – appropriate technology
- Market assessment – ability and willingness to pay
- Tariff setting
- Political backing
- Accessibility for construction, supply of fuel, customer access to market, etc.
- Technology neutrality – consider all potential energy source options
- Customer profile – household, commerce, industrial and institutional
- Export/Import potential?
- Community acceptance
- Comparison with NEPA
- Legal Framework

- Criteria for choice of villages

Site Selection Criteria for Pilots

- Sufficient Demand
- Community acceptance
- Willingness/ability to pay
- Existing activities that will benefit from power supply
- Potential for combined service delivery (power & electricity)
- Community contribution – equity
- For diesel (combined heat & power)
- Cost of investment
- Potential project sponsor

Make or Break Issues

Political backing

Community acceptance

Availability of resources

Initial Sponsor

Niger State Rural Electrification Board

Rural Electrification Road Map

i. 18 July (4weeks) First Inception Report with a tentative draft proposal. GM will bring in some potential sponsors.
ii. Call for Expression of Interest
iii. Develop bid package
iv. Bidders Conference
v. Evaluate, Shortlist & Award
vi. Review site selection based on criteria

Rural Telecommunication

Description

Fixed Wireless Network

Size

Cost: N500 Million investment

Sponsor

Open tender

Issues

- Legal framework
- Technology Choice
- Create State Department for Telecommunication
- Licensing Cost/Processes
- Rural telecom fund operation
- Market size/demand
- Priorities of communities
- Affordability

Telecom Road Map

- Request Governor to create Communication Department (Chamber of Commerce)
- Consult NCC regarding rural access promotion activities (Rural Telecom Fund)
- Assess plans of Niger State Fixed Wireless Licenses and Digital Mobile Licenses (Globalcom, MTN, Econet & Nitel).

Annex 5

Project Data Sheets

Niger Water

PROJECT DATA SHEET

Project Type	Niger State Water Suleja and/or Mokwa areas
Description	Peri-urban. Private operation of existing water works in a small town. Concession/ownership including refurbishment. Provision of potable water.
Size/Scale	Population 5 000 – 15 000 people.
Cost estimate	N50m – N100m
Sponsor	To be selected by open bidding. There are some potentially interested sponsors.
Issues	Finance Opportunities for expansion (new water source?) Local distribution options Political backing Technical design – appropriate technology to minimise capital and operating costs Quality of raw water Define roles of stakeholders (Government, Private Sector, Communities etc)
Road map	1) Clear the make or break issues – Water Board – July 18 2) Niger State to prepare Inception Report (Draft Project Proposal, outline of bid package, possible financing strategy) for meeting on 18 July at WB offices Abuja 3) Invite expressions of interest 4) Bidders conference 4) Develop bid package 5) Issue, evaluate and award bids

Niger Telecom

PROJECT DATA SHEET

Project Type	Niger State Telecom
Description	A policy to develop telecommunications in Niger State
Size/Scale	Niger State
Cost estimate	N500m
Sponsor	
Issues	Licensing costs/process Rural Telecom fund operation Market size/demand Priorities of communities Affordability Legal framework Technology choice Create State Department for Communications?
Road map	1) Request Government to create Communications Department – Chamber of Commerce 2) Consult NCC regarding rural access promotion activities (Rural Telecom Fund) Assess plans of Niger State licensees – Private Sector 2) Prepare Inception Report (Draft Project Proposal, possible financing strategy) for meeting on 18 July at WB offices Abuja

Niger Electricity

PROJECT DATA SHEET

Project Type	Niger State Electricity Konkoso village
Description	Border village, isolated power supply, new site
Size/Scale	Population 500 people, 100 households, 500kVA diesel
Cost estimate	N30m
Sponsor	To be selected by open bidding
Issues	Design – appropriate technology Market assessment, ability and willingness to pay Tariff setting Political backing Accessibility (for construction, fuel, customer access to market etc) Technology neutral – consider all options Customer profile – household, commercial, industrial, institutional Import/export potential (both energy and products) Community acceptance Comparison with NEPA Legal framework Criteria for selection of location
Road map	1) Review site selection based on criteria – Electricity Board 2) Niger State to prepare Inception Report (Draft Project Proposal, outline of bid package, possible financing strategy) for meeting on 18 July at WB offices Abuja 3) Invite expressions of interest 4) Bidders conference 4) Develop bid package 5) Issue, evaluate and award bids

NEPA Retail Outsourcing

RETAIL OUTSOURCING PILOT PROJECTS
PROJECT DATA SHEET

Project Type	NEPA	Pilot outsourcing of revenue collection
Description	The primary objective is to improve revenue collection for NEPA. A secondary objective is to provide opportunities for employment of NEPA staff that might need employment after NEPA is restructured. The design of the pilot must be fully consistent with the on going restructuring of NEPA.	
Concept	This is a pilot project. There will be specific geographic areas. Each area will be ring-fenced and be the area of operation of a specific company or private entity. All electricity flowing into the area will be bulk metered. All activities inside the area will be the responsibility of the sponsor/separate entity. It is envisaged that these entities will be staffed (substantially) by (former) NEPA personnel. In the pilot stage, it is envisaged that this opportunity would be made available to current NEPA staff that are ready to leave NEPA to establish a new company that will provide services in the restructured power sector. It is expected that the incentives for staff to make this choice would include the normal severance package plus assistance in setting up a new private company with some initial contract for providing the services. Two models of this concept will be explored initially. One on the basis of a NEPA based sponsor who will leave NEPA to initiate a private company and may need business advisory services and the second one based on private enterprise bidding for an area and using whatever personnel he chooses. The benefits and disadvantages of the two models with respect to fulfilling the above objectives should be explicitly addressed.	
Size/Scale	Applicable to any community large enough to be viable. The overall program should remain at a pilot level until the process and performance has been demonstrated.	
Cost estimate		
Sponsor	NEPA will prepare the concept plan, thereafter sponsors will be identified. The NEPA concept plan must be sufficiently detailed to enable sponsors to prepare business plans after the proposed workshop.	

Issues related to the concept	Number one consideration is that this pilot program is fully consistent with the planned unbundling and restructuring. Pensions for NEPA staff who leave Incentives to attract people from NEPA to these entities Tariffs Billing, metering Debts (outstanding) Performance monitoring Business advisory service Finance Expansion of network Security/vandalism Ownership of the network Maintenance standards Database Future options related to the restructuring of NEPA Identification of suitable sites Advertising and running of workshops. Timing: what would need to be in place to allow the projects to start and when would expected benefits be delivered.
Road map	1) NEPA to prepare one Concept Planwith two models, to be submitted to the Board and returned with comments by July 4. Then to be presented at 7th Power Sector Reform Leaders workshop. 2) After concept is agreed at the August workshop, Advertise concept to potential sponsors inside and outside NEPA and invite to a workshop (max 10 –15 sponsors for 3 –5 pilots) 3) Identify sponsors who will produce business plans/bids 4) Evaluate and award

Delta Water

PROJECT DATA SHEET

Project Type	Delta State Water Delta State
Description	Private provision of potable water from deep aquifers that cannot be sourced using solar power.
Size/Scale	Applicable to many communities in Delta State
Cost estimate	
Sponsor	To be identified
Issues	Power source Combine water and power - options Regulatory distribution issues Treatment costs Vendors as part of the solution (formalising the role of water vendors) Willingness to pay Funding/subsidies UNICEF attitude to pumping –manual versus electric Availability of water resources
Road map	1) Delta State to drive the concept and address issues to the point where sponsors can be identified 2) Prepare Business Plan 3) Review of progress 16 July 2003 at WB offices Abuja 4) Submission of business plans 13 August 2003 at Abuja at WB offices

Delta Telecom

PROJECT DATA SHEET

Project Type	Delta State Telecom Delta State
Description	Private provision of IT Education and internet access to all 25 LGAs in Delta State using VSAT technology and solar energy
Size/Scale	Applicable to many communities in Delta State
Cost estimate	
Sponsor	To be identified
Issues	Inclusion of rural telephony within concept Community development plans/prospects Alignment with investment priorities (State, community, etc,) Roles of each stakeholders
Road map	1) Delta State to drive the concept and address issues to the point where sponsors can be identified 2) Prepare Business Plan 3) Review of progress 16 July 2003 at WB offices Abuja 4) Submission of business plans 13 August 2003 at Abuja at WB offices

Delta Electricity Rural Power

PROJECT DATA SHEET

Project Type	Delta State Electricity Rural gas turbine 2.5MW or 5MW Obotebe/Burutu LGAs and Ogidigbean, Warri West LGAs
Description	Gas Turbine operating from flare gas The project proposes using flare gas collected at the nearest flare point and used directly in a gas turbine to generate electricity for local rural communities. A gas turbine is preferred to a gas engine as the gas quality will be very variable. The project also includes a distribution network to supply electricity to the nearby communities.
Size/Scale	Applicable to any community large enough to justify power from a gas turbine and close to a flare gas source.
Cost estimate	$6-8m (2.5MW) to $11-13m (5MW)
Sponsor	Income Electrix Ltd
Issues	Access to flared gas Gas Delivery Terms (Cost/m^3) to be negotiated with NGC) There is need to explore current Federal Government policy on the sale of gas. Can/will the government subsidize gas for power generation? IPP Terms/ Power Sales agreement (negotiated with NEPA) Tariff regime including connection costs Civil Unrest/Vandalisation – mitigation, prevention and responsibility for repairs Financial Analysis Technical Design/minimize costs Management and Administrative arrangements Competitiveness of selected investment – yardsticks Synchronous generation with NEPA Establishing Community buy-in Legal approval Replicability of project Reliability/Back-up Rural Consumption levels Design cost reduction/technical standards Affordability Grid or off grid solutions Subsidy level, sources and what is being subsidized Operation and maintenance costs Tariff (including indexing) Sorting out stakeholders – defining roles Danger of stranded assets Currency risks Community Development Plan

Road map	1) Review critical issues, namely: Access to flared gas Gas delivery terms IPP terms Tariff terms Legal approval World bank and Delta State will provide letters of support to assist with the approach to Shell, Agip and Chevron for access to flared gas 2) Prepare Business Plan 3) Review of progress 16 July 2003 at WB offices Abuja 4) Submission of business plans 13 August 2003 at Abuja at WB offices

Delta Electricity GEEG

PROJECT DATA SHEET

Project Type	Delta State Electricity Petroleum Training Institute
Description	Gas Engine Embedded Generation (GEEG). The project proposes a 25MW embedded generator for the supply of power to the Petroleum Training Institute (PTI) and possibly nearby communities. The gas engine plant will source gas through a Nigeria Gas Company pipeline running through PTI. It envisages a possible grid tie with NEPA with bulk power sales agreement with the national utility. Sterling Oil and Gas has conducted extensive consultation with key stakeholders including NEPA, NGC, PTI, Federal Ministry of Power and Steel and the Delta State Government. It has also concluded a PEST Analysis – including political, economic, socio-cultural and technological issues.
Size/Scale	Applicable to any large industry on a gas line
Cost estimate	$400/kVA of generator size, for 25MW generator - $10m capital cost, $2.25m/year operating expenses
Sponsor	Stan Rerri, CEO, Sterling Oil and Gas
Issues	Gas Delivery Terms (Cost/m^3) to be negotiated with NGC) There is need to explore current Federal Government policy on the sale of gas. Can/will the government subsidize gas for power generation? IPP Terms/ Power Sales agreement (negotiated with NEPA) Tariff regime including connection costs Civil Unrest/Vandalisation – mitigation, prevention and responsibility for repairs Financial Analysis Technical Design/minimize costs Management and Administrative arrangements Competitiveness of selected investment – yardsticks Synchronous generation with NEPA Establishing Community buy-in Legal approval Replicability of project Reliability/Back-up
Road map	1) Review critical issues, namely: Gas delivery terms IPP terms Tariff terms Legal approval 2) Prepare Business Plan 3) Review of progress 16 July 2003 at WB offices Abuja 4) Submission of business plans 13 August 2003 at Abuja at WB offices

Joint UNDP/World Bank

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

LIST OF TECHNICAL PAPER SERIES

Region/Country	*Activity/Report Title*	*Date*	*Number*
	SUB-SAHARAN AFRICA (AFR)		
Africa	Power Trade in Nile Basin Initiative Phase II (CD Only): *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*	04/05	067/05
Cameroon	Decentralized Rural Electrification Project in Cameroon	01/05	087/05
Chad	Revenue Management Seminar. Oslo, June 25-26, 2003. (CD Only)	06/05	075/05
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
Ghana	Poverty and Social Impact Analysis of Electricity Tariffs	12/05	088/05
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
	Expanding Access to Rural Infrastructure Issues and Options for Rural Electrification, Water Supply and Telecommunications	12/05	091/05
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
	Landfill Gas Capture Opportunity in Sub Saharan Africa	06/05	074/05
	The Evolution of Enterprise Reform in Africa: From State-owned Enterprises to Private Participation in Infrastructure —and Back?	11/05	084/05

Region/Country	*Activity/Report Title*	*Date*	*Number*
Senegal	Regional Conference on the Phase-Out of Leaded Gasoline in Sub-Saharan Africa	03/02	022/02
Senegal	Elimination du Plomb dans I'Essence en Afrique Sub-Saharienne Conference Sous Regionales du Groupe Afrique de I'Quest. Dakar, Senegal. March 26-27, 2002.	12/03	046/03
	Alleviating Fuel Adulteration Practices in the Downstream Oil Sector in Senegal	09/05	079/05
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
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
	TA For Capacity Building of the Electricity Authority	09/05	076/05
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
Philippines	Rural Electrification Regulation Framework. (CD Only).	10/05	080/05
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

Region/Country	*Activity/Report Title*	*Date*	*Number*
	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
Uzbekistan	Energy Efficiency in Urban Water Utilities in Central Asia	10/05	082/05
	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
Morocco	Amélioration de d´Efficacité Energie: Environnement de la Zone Industrielle de Sidi Bernoussi, Casablanca	12/05	085/05
	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
Chile	Desafíos de la Electrificación Rural	10/05	082/05
Ecuador	Programa de Entrenamiento a Representantes de Nacionalidades Amazónicas en Temas Hidrocarburíferos	08/02	025/02
	Stimulating the Picohydropower Market for Low-Income Households in Ecuador	12/05	090/05
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

Region/Country	*Activity/Report Title*	*Date*	*Number*
	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
	Study on Investment and Private Sector Participation in Power Distribution in Latin America and the Caribbean Region	12/05	089/05
	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
	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
	Operating Utility DSM Programs in a Restructuring Electricity Sector	12/05	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
	Renewable Energy Toolkit Needs Assessment	08/05	077/05
	Portable Solar Photovoltaic Lanterns: Performance and	08/05	078/05

Region/Country	*Activity/Report Title*	*Date*	*Number*
	Certification Specification and Type Approval		
	Crude Oil Prices Differentials and Differences in Oil Qualities:		
	A Statistical Analysis	10/05	081/05
	Operating Utility DSM Programs in a Restructuring Electricity Sector	12/05	086/05

Last report added to this list: ESMAP Technical Paper 091/05.