Expert Group Meeting

Promoting Energy Access for the urban poor in Africa: Approaches and Challenges in Slum Electrification

FINAL REPORT

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TABLE OF CONTENTS

LIST OF ANNEXES

1. BACKGROUND TO THE WORKSHOP

UN-Habitat is in the process of establishing a worldwide programme to address the problems of access to energy among the poor people living in urban areas. The programme known as the Global Energy Network for the Urban Settlements (GENUS) is an emerging partnership of Governments, the private sector, development agencies and non-governmental organizations, working in the urban energy sector. GENUS aims to provide a world-wide platform for exchange and dissemination of best practices, technologies and capacity-building in approaches to affordable, modern energy services which is a pre-requisite for sustainable development and poverty alleviation and, more specifically, for achieving each of the Millennium Development Goals (MDGs).

The formation of GENUS is informed by the fact that currently, there are wide disparities in the level of energy consumption within and between developed and developing countries. One third (two billion people) of the global population has no access to basic energy services. Most of them (1.6 billion people) live in developing countries, mainly in South Asia and in Sub-Saharan Africa. They depend on inefficient biomass fuels, such as wood, animal and crop waste for cooking and heating, which have detrimental effects on air quality and health. About three-quarters of the world's commercial energy is consumed in urban areas, and many of the people in direst need of access to modern energy systems are located in rapidly growing informal urban settlements (slums) throughout the developing world. Despite such numbers, the energy needs of poor urban households, and particularly of women, in developing countries have not been properly addressed, as development efforts have focused intensely on the rural poor.

Cities in developing countries require a rapid increase in energy production and consumption to accelerate economic development, alleviate poverty and meet the basic needs of their populations. Urban areas offer special opportunities and thus need special attention. They are a hub for economic development and high population density offers possibilities for good economics in terms of electricity access. Different challenges constrain the capacity of city managers to conceive and design appropriate programs and policies in support of energy access for poor urban settlements.

GENUS is a global programme structured geographically to operate in Asia, Latin America and Africa. It addresses three key themes of energy access for the urban poor,

namely (i) Improved urban mobility for the poor- specifically targeted for Asia; (ii) Slum electrification in Africa; and (iii) Energy from waste in Latin America.

The workshop on challenges and approaches to slum electrification in Africa was held 26th-28th October at the UN headquarters in Nairobi. This was the second workshop held under the auspices of GENUS, the first one having been held in Yogyakarta, Indonesia in May 2009, with a focus on transport for the urban poor in Asia.

The workshop on slum electrification brought together key agencies, institutions and stakeholders involved in urban energy issues in Africa. It provided an interactive forum for the exchange of experiences, practices, lessons, and perspectives on slum electrification, especially in regard to the challenge of how utilities and public authorities manage to bridge the gap between the ability to pay for monthly service and user fees and the upfront costs necessary for connection to the grid and proper metering.

The opening of the workshop was officiated by Mr. Patrick Nyoike, the Permanent Secretary, Ministry of Energy, Government of Kenya. In his speech, the Permanent Secretary underscored the government's commitment in supporting Slum Electrification Schemes in a way that is consistent with its available resources. He identified the key operational challenges associated with Slum Electrification, including:

- Lack of provisions for the right of way due to haphazard construction in informal settlements
- Vandalism of conductors and transformers;
- Illegal connections that pose dangers of fire

The workshop also formed the basis of the launch of the GENUS network and programme of work on Slum Electrification in Africa. Key outcomes of the workshop were:

- Helped to frame the key issues, challenges and opportunities for addressing access to electricity in informal settlements in Africa.
- Provided a platform to establish some of the key stakeholders in Africa to be enjoined in the emerging GENUS partnerships and networks.

- Broad agreement on the structure of the GENUS network and possible steering mechanism in Africa.
- Broad agreement on a comprehensive operating plan and objectives of the GENUS in Africa.

2. SUMMARY OF KEY ISSUES AND CHALLENGES IN SLUM ELECTRIFICATION

This section provides a summarised version of some of the challenges and issues related to slum electrification as discussed in the workshop. The issues were divided into three categories, namely policy, programme design and data or evidence base.

2.1 Policy issues

- Slum Electrification programmes are often not mainstreamed into national policies and programmes and supported in the same way that say, rural electrification programmes are supported. For these programmes to be successful, they need to be underpinned by a national policy strategy and implemented through a national programme that is well resourced.
- Related to the above is the challenge of political ambivalence to slum/informal settlements. There is a lingering fear that providing infrastructural investments in slum areas is a step towards legitimising their existence. Reluctance to accept the reality of slum settlements means that these areas are not considered sustainable platforms for long term investments.
- Social tariffs: There is limited policy development in respect to providing affordable tariffs to vulnerable and fuel poor customers.

2.2 Programme design issues

- How are upfront investment costs to be met? This is one of the key challenges confronting utilities and governments, especially in view of the investment profile risks associated with slum electrification programmes
- Related to the above point, is whether slum electrification programmes should be designed as long term investments or transitional measures pending resolution of the long-term statuses of informal settlements
- It is important to examine the spectrum of possible innovative off grid solutions as a complementary measure to slum electrification
- Address the common feeling by utilities that slums are major energy loss centres.
- It is important for slum electrification programme to establish partnerships with communities and small businesses that supply and consume energy.

2.3 Data issues

- Generally data on rates of connectivity- both legal and illegal - in slum areas is very unreliable. There is need to work on establishing reasonable data bases for policy development and programme design purposes
- Although there is anecdotal evidence that the poor spend more on energy than high income earners, it is not clear how this fact is factored as part of normative policy?
- There is need for rigorous monitoring and evaluation of slum electrification programmes, and documentation of lessons learnt.

3. ESTABLISHING THE GENUS NETWORK ON SLUM ELECTRIFICATION IN AFRICA

3.1 GENUS Structure

The issues of governance in GENUS are related to the fact that it is a network that needs to have a representative and transparent mechanism for accounting and reporting to the various constituent parts. The governance elements discussed in the workshop were: [i] GENUS secretariat; [ii] Steering Committee [iii]General Assembly [iv]National focal points and general membership. The discussions and recommendations are outlined below.

- **GENUS Secretariat:** There is need for a secretariat that coordinates the core network activities such as communication, network events etc.

Recommendation*:* UN-HABITAT to continue acting as the secretariat. This position should be reviewed possibly in the second phase of GENUS

- **A steering/advisory committee**: It was ***recommended*** that a steering committee for the slum electrification network in Africa be established. The function of the steering committee is to
  - Review and advice on work plans and program prioritization and approval.
  - Advice on resource mobilization and management.
  - Setup technical working groups/work packages.

A list of possible members of ***the interim steering group was proposed***. They are listed in the table below. The nominees are required to write down the value and strengths they will bring into the network, and how their institutions can support the performance of GENUS. A final list of 5-7 members will be arrived after the selection process has been completed.

1. Benoit Dome	Director Copper Benelux and Building Wire manager, Europe and Africa
2. Touria Dafrallah	Research Coordinator ENDA
3. Jared Omondi Othieno	The Kenya Power & Lighting Co. Ltd.
4. Maboe Maphaka	ESKOM Distribution, South Africa
5. Hady Sheriff	Executive Director, Center for Sustainable Energy Technology (CSET)
6. Moses Murengezi	Advisor to the Chairman, Energy and Mineral Sector Working Group Ministry of Energy and Mineral Development
7. Christophe Cluzeau	LYDEC, Morocco
8 Bandu Anatole Kubuya	Co-Director, Groupe D'Action pur le Droit, Congo DRC
9. Mohamed Dagher	Country Group Manager – Philips

- **A General Assembly:** It was proposed that a General Assembly be established as the overall oversight body for the network. The general assembly would have representatives from key stakeholders and would meet annually. Their function would be to:

  - Receive reports from steering committee and secretariat.
  - Receive reports from local focal points.
  - Approve the technical operations of the secretariat

It was ***recommended*** that the 1st General Assembly be held in October 2010

- **National Anchor institutions and general GENUS membership**: It was recommended that national and sub-regional anchor institutions and general membership of the network will evolve with time.

However, the GENUS secretariat should cultivate partnerships with potential GENUS network participants who include: energy utility companies, private sector bodies in the energy sector, -policy makers, NGOs, university/research institutions, donors and development agencies, the UN, the World Bank Group, Regional Economic Communities and the Development Banks.

It was proposed that for GENUS to add value, the process of developing national focal points should be focused on countries with weak or no slum electrification programs. GENUS would help them draw on experiences from such countries as South Africa, Morocco, Egypt, Ghana and Kenya.

3.2 Communication outputs

It was recommended that GENUS focus on communication products such as policy briefs and dialogues and "How To" manual and toolkits. A GENUS website is under development and it will be online shortly.

4. FORMAL PRESENTATIONS

4.1 Overview of slum electrification: Global vs. African experience – *Ms Connie Smyser, Smyser Associates*

This was the lead presentation for the workshop, commissioned by UN-HABITAT. It gave an overview on various issues related to slum electrification. It highlighted which particular issues are of special relevance for slum electrification in Africa.

There are various interests that are related to slum electrification. For Governments, universal access to electricity is a development goal. Utility companies are interested in extending their services in order to increase their revenues. Revenue losses are a big problem for utility companies especially in slum settlements where illegal access to their supply is prevalent.

There are many common elements in programs on slum electrification that have been successful. First is community engagement, which is mostly about reliability and trust built between the community and the program and visa-versa. Another element is having a comprehensive service plan on how to lay out the whole electrification program, including aspects like education or community development that are going along with it. Once it comes to installation it is very important to work with customers on a daily basis. Once the system is designed and it is proven, scaling-up can follow.

The electrification situation in slums is always slightly different depending for instance on the type of community, the income level and the cost of service provision. A common problem is electricity theft. Different technical solutions for installations can be found ranging from fairly simple but less effective solutions to sophisticated but more costly, more effective ones. For instance, encasing meters in plastic or placing meter boxes at the slum perimeter are low cost but can easily be foiled by determined thieves. Another solution can be tamper-sensitive meters, which automatically signal any tampering attempt via GMS or power line signal. More expensive coaxial cables in the service drop can also trigger a short circuit if there is an attempt to pierce the cable to make an illegal connection.

Another issue is the improvement of internal safety, especially in structures which are poorly wired. Solutions here include ready boards (all in one wiring) or the internal rewiring in every connected structure.

Certain "generic" problems in Africa impede serving low income areas, more than in other regions. Supply shortages and low connection rates even for higher income consumers make it difficult to justify connecting low income areas first. Even if supply is adequate and connection rates are high, low income levels, inflexible tariff structures, and unaffordable connection fees are a barrier to the electrification of slums.

Prepayment systems seem to be a very viable payment option in Africa if judged by the number of countries that have them and their general satisfaction with them. However, there are very high investment costs associated with such systems, and they must be accompanied by the introduction of new commercial systems and hardware that may not mesh with the rest of the service system. This creates an impediment for companies to get started with prepayment.

The case study of EDM Mozambique illustrates the implementation of a prepayment system. Distribution losses of 43% due to fraud, bad collection rate, poor grid distribution quality, customers without meters, and a manual billing and collection system were the starting point in 1995, a somewhat typical example for problems utility companies are facing in Africa. Prepayment was introduced as part of a commercialization strategy. This resulted in an increased number of customers, an improved collection rate and a tremendous reduction of distribution losses from 43% to 18%. The major concern was the life expectancy of meters and the potentially high costs for replacement.

Factors of success in slum electrification include:

- The focus on consumer needs (credit for connection costs, tailored payment, assistance with affordability and controllability of consumption),
- Physical vigilance supported by data monitoring and balancing against electricity supplied,
- The technology or personnel upgrade to match degree and location of theft, fraud and mismanagement,
- Focusing on theft reduction by larger customers and large pockets of theft (investments are more easily justified),

- Planning for the long haul (success may take 10 years of sustained effort).

On the company side, financial viability is very important for the success of slum electrification. This includes questions like:

- Is prepayment necessary for a successful program?
- What are the true costs of prepayment systems and how well do they integrate into existing technical and data management systems?
- With low connection rates or poor cost recovery, which investments are justified?

On the consumer side success is determined by the following questions:

- How can we overcome issues with connection costs, affordability?
- Should the approach be different for short supply situations? Can energy efficiency introduced at the time of regularization (theft reduction) improve the financial viability for the company while helping the new customer to afford his or her consumption?

In terms of renewable energy it seems not reasonable to start major PV-based electrification, but rather encourage the use of small or micro-devices, for example solar lanterns, until grid based electrification becomes available.

Questions and comments:

1) Are there any figures or estimates available on typical payback periods of different technologies applied in slum electrification?

A good indicator of success is the reduction of losses, which can be equivalent to millions of dollars. The sustained loss reduction can help to estimate returns to investments. A cost-benefit analysis with respect to investments and sustained loss reduction is possible. Also the scale of an intervention plays a role here.

2) Tenure rights and missing identification documents are a very important issue in informal settlements or peri-urban areas, which impact on the issue of electrification. Could you elaborate on this influence of informality and lack of identification on slum electrification?

This is a huge issue, because existing data usually refer to registered people. Informal people are often not even considered eligible and companies might even be prohibited to enter informal settlements. But that depends on the particular country's -- or even city's – policies with respect to informality. It is certainly important to also bring those people back into the social systems, into society and the push to electrify them may in fact accelerate that process.

3) What are the main barriers to slum electrification programs? Why are there not more slum electrification programs to be found in Africa? What is the role of policy makers in that respect?

The main barriers might have to do with policies regarding people that cannot afford to pay upfront costs for initial connection to the grid. A second barrier is a mental barrier of policy makers, who think that it is impossible to implement any electrification program in slum areas, just by looking at them, especially if there are other areas that are not slums and which are also awaiting connection. In terms of policy making it is very important to bring together urban and rural policies in a way that no one is discriminated. Tariffs, especially social tariffs, are very important in respect to informal settlements. These issues are in the sphere of policy making, too.

4.2 Private sector interests and needs for infrastructure investments in Africa – *Mr. Joel Kolker, Public Private Infrastructure Advisory Facility*

Joel Kolker provided an overview on private sector interests and needs especially regarding infrastructure projects in Africa. He did focus on the types of partnerships, on who the private sector is and what the private sector is seeking in investing in infrastructure in Africa. Moreover he briefly discussed the implications of the financial crisis for the development and implementation of infrastructure projects.

At the very highest level there are three types of partnerships:

- Management contracts, which can vary in size and in focus and offer a great deal of flexibility,
- Public Private Partnerships, which are usually connected to larger investments, like for instance the classical PPPs *Build-Own-Operate* or *Build-Own-Transfer*,
- Debt instruments can also be seen as a form of partnership, as financial investments are also shouldered by the private sector especially in local financial markets.

The private sector includes vendors and suppliers of goods, service providers, e.g. for maintenance or revenue collection, special purpose vehicle, utilities (as they have been privatized), as well as financial institutions like banks, pension funds and insurance companies.

In case of investments, the private sector is seeking for an environment that is guided by transparency in the process, mutual agendas (by the public and private partners respectively), solid project economics, reasonable risk allocation, clear tendering procedures, solid documentation, a real government commitment and profits to be generated.

For project economics this means that all revenues are clearly projected and articulated in terms of tariffs and all the different categories of expenditures. It needs to be accepted on the public sector side that the private sector must make a profit. The private sector will not be interested in a project that is not covering the costs.

In terms of risk allocation, previously it has been the understanding on the public side that the private sector would cover a large deal of risk. The experience over the past years however has shown that a fair risk allocation is necessary. In essence the private sector can only accept a risk that is within its range of control. There must be a very thorough understanding on how risks are allocated. Risks should be allocated to the parties that have most influence and control over them. Special attention needs to be given to politically induced risks.

Procedures need to be handled in a transparent and experienced manner. Uncertain or unrealistic timelines and bad documentation create risks and costs. Good bidders won't bid, if they think the selection may be biased. The public sector puts emphasis on dependability, the ability to deliver on time, good documentation and experienced advisers that can bring in solid international and domestic experiences.

Real government commitment is essential for a Public Private Partnership. Changing political agendas are a great deal of concern in this respect, as much as donor driven processes that lead into PPPs, where governments were not really interested in the first place. In consequence, top-ranking politicians, i.e. ministers, should take leading roles in

the process and a transaction should only be undertaken, if there is a genuine interest on the public side.

Profit is the main motivation of the private sector to go into partnership with the public sector. Profits are made through a delivery of better services at lower costs. The interest of the public sector is to expand and improve services at a level that is affordable to the public. A regulatory environment as well as a public debate can help to determine what a reasonable profit for the private sector is.

The fiscal crisis has had an impact on financing projects, but the private sector has not removed itself from investing in infrastructure. Good projects are still finding financing. Impacts of the financial crisis include:

- The flight to quality, i.e. projects require transparency, good government commitment, solid understanding of what is being required and good project economics,
- Debt markets are tightening, i.e. interest rates are going up and repayment periods are getting shorter,
- Financing is more reliant on Direct Foreign Investments (for both, investments and guaranties),
- Local private operators and investors play an increased role,
- Smaller is better in terms of finance,
- Strong, transparent regulatory environments are required by the private sector.

4.3 The lighting Africa initiative – *Mr. Arthur Itotia Njagi, IFC Advisory Services, World Bank Group*

Arthur Itotia Njagi provided an introduction to the Lighting Africa Initiative. Off-grid lighting is seen as an ideal interim solution until grid lighting has been put in place at a site. Grid lighting is seen as the optimal and best form of lighting. Technologies have been developed and improved in recent years allowing the utilization of renewable sources of energy. Especially so-called solar lanterns using photovoltaic elements are a better and on the long run cheaper alternative to conventional fuel lit lamps.

The objective of *Lighting Africa* is to mobilize the private sector to provide affordable, renewable, clean lighting to 2.5 million people in Africa. This will be achieved by facilitating sales of a minimum of 500,000 off-grid lighting units by 2012 while at the

same time, establishing a sustainable commercial platform to realize the vision of supplying 250 million people with off-grid lighting products by 2030, which is an ambitious target. Lighting Africa works with manufacturers, distributors and potential consumers of off-grid lighting solutions, including an element of consumer finance for the low-income market.

According to a market survey undertaken by Lighting Africa, the proportion of households that are connected to the grid is estimated at between 18-23% in Kenya. 52% of households use a hurricane lamp and 23.7% open wick lamps. Together this accounts for approximately 5.7 million households in Kenya, which is a significant market.

An average household in Kenya could save up to KES7000 in a period of two years just by switching to solar lantern instead of using conventional fuel-based lighting. On a national level, KES4-6 billion is currently spent on fuel-based lighting.

Off-grid solutions provide a number of opportunities, including the avoidance of green house gas emissions and superior lighting compared to what the people have in use today. There are three main categories of low cost off-grid lighting solutions. These are solar torches, task lights and solar lanterns. These low cost solutions are usually smaller in their power output as compared for instance to solar home systems. However, the supply side, the industries, is characterized by rapid change and innovation towards better quality of light, longer usage times, lower pricing, clean lighting and a wide range of products being offered.

Lighting Africa has provided a household survey in order to find out more about the demand side of the market, i.e. the potential buyers of such products especially in the low-income market segment. The following questions have been asked.

- Would you buy it?
- Is the idea genuinely new and unique?
- Is the idea clear to you?
- Is it relevant to you?
- Do you find it exciting?
- Do you actually like the idea?
- Do you think it would actually offer value for money?
- How often would you buy it?

- Do you believe it?

All questions were asked before and after a five-day test of the equipment by the target group. The tested products (all the three categories of micro-solar systems) were generally very well received. Some differences appeared in the answering behavior. So did the excitement rise significantly after the use. After recall respondents indicated that the product was worth more than other products and the willingness to purchase the product in the future remained high. The perceived price was USD20-40, which was higher than the recommended retail price.

Challenges related to the marketing of the products were revealed:

- The low income means that people cannot afford large upfront payments,
- The limited access to finance means these people operate outside the banking sphere,
- The limited distribution means the channels within the reach of the targeted group cannot afford to stock off-grid products,
- The limited awareness means solar energy is a new innovation for the segment,
- Security problems also impact on the question of using solar systems as panels may be stolen.

Solutions could focus around the following elements:

- Providing an avenue/structure for a monthly installment payment plan.
- MFIs as a viable option either informal or formal in nature.
- Exploring an "order based" distribution option with suppliers,
- Awareness campaigns and experiential marketing,
- Setting up charging stations.

It has been mentioned that the payback period is significantly lower than the life expectancy of the micro-solar systems, ultimately resulting in cost saving through the use of these devices. A payback period of around eight months or below can be expected.

4.4 The European Union Energy Initiative-Partnership Dialogue Facility (EUIE-PDF) – *Mr. Michael Franz, GTZ*

Michael Franz provided a brief overview of the European Union Energy Initiative – Partnership Dialogue Facility (EUIE-PDF), which is hosted by the German Agency for

Technical Cooperation (GTZ) on behalf of the European Union. He also expressed the offer by the EUIE as well as by GTZ's Regional Energy Advisory Board for supporting UN-HABITAT's initiative on Slum Electrification.

The Partnership Dialogue Facility is an instrument of the European Energy Initiative, which is funded by six of the EU-member states in order to facilitate a dialogue between the European Union and the partner countries, including stakeholders at a national and regional level.

PDF's activities include:

- The development of energy policies and strategies at national and regional level,
- The organization of international dialogue events,
- The identification and conduct of relevant thematic studies,
- The facilitation of a dialogue between donors,
- Knowledge sharing activities regarding donor activities, policies and strategies through events on specific themes.

During the first phase (2005-2009) 31 activities in 15 countries were supported, involving seven regional organizations. Six thematic studies were commenced and four international workshops were facilitated.

The second phase will focus more on the energy partnership between EU and Africa. New guidelines for Biomass energy strategies will be developed, as well as studies on master plans for Africa's electrification (also with ESMAP).

Regional initiatives include:

- Ghana/ECOWAS: Energy access planning and monitoring, using GIS,
- The SADC: Energy Access Strategy,
- Angola: Renewable Energy policy,
- Burundi: Energy policy,
- Niger: Energy access planning,
- Malawi: Updated energy policy,
- Zambia and Tanzania: Biomass energy strategies,
- Senegal: LPG studies.

The PDF can help in UN-HABITAT's initiative on slum electrification by sharing experiences from other countries and the regions in terms of policy framework matters. Important here is the question of creating the right policies, strategies, regulations that might be needed to support slum electrification. EUEI-PDF could contribute to answering this question with commissioning a study, e.g. regarding the national context or comparative analyses.

4.5 Increasing access to modern energy services for the urban and the peri-urban poor: EAC energy scaling-up initiative – *Mr. Paul Kirai, Integrated Energy Solutions, Kenya*

Paul Kirai presented on the Eastern African Energy Scaling-Up Initiative. Its focus is the delivery of modern energy services. All countries of the East African Community (EAC) are participating in the initiative.

Inadequate modern energy services pose a major risk to the EAC countries' ability to meet MDGs, and reduce poverty. The energy "poverty" affects all the countries in the region with a population of over 100 million people. A regional approach to energy access provides synergies through the EAC Secretariat, cross-border lessons learning and cost effectiveness. The Strategy is built on four simple and achievable targets, which serve the interests of the region.

The targets are:

1. Access to modern cooking energy for 50% of traditional biomass users.
2. Access to reliable electricity for all urban and peri-urban poor.
3. Access to modern energy services for all schools, clinics, hospitals and community centers.
4. Access to mechanical power within the community for productive use and heating

The strategy has support from local stakeholders, governments and energy providers.

The strategy seeks to engage EAC partner states in an ambitious initiative to scale up access to modern energy services to support the achievement of the Millennium Development Goals and poverty reduction. Its focus on MDGs allows it to demonstrate results aligned with the goals of many development partners. EAC Council of Ministers adopted it in November 2006. The main objective is to enable at least half of the

population to access modern energy services by 2015 i.e. l9.6 million households (approx 48 million people) and 23,000 extra localities.

The EAC structure provides opportunities to increase energy access in member countries through:

- Considerable political commitment incorporating five heads of State and many high level leaders.
- Established mechanisms for regional cooperation and decision-making.
- Economies of scale.
- Synergy and cross learning opportunities.
- Peer pressure among member states and healthy competition.

The *Target 2* of the strategy puts a focus on slum electrification: *Access to reliable electricity for all peri-urban poor*. The main concerns are the costs of electricity connections and the persistent outages in peri-urban areas. The strategy will focus on introducing utility-led financing and a cost reduction program for new connections. Connection barriers are lowered in this way. Here, locally based community distribution intermediaries may be useful partners to fill customer service gaps the utilities cannot breach.

In 2004 the electrification gap in the EAC countries was 86% or 20.3 million households. If the present trend continues the number of households without electricity will increase to 26.9 million by 2015 out of which eight million households will be in urban and peri-urban areas. The projected electrification gap will then be between 76-82%.

The existing challenges of slum electrification in the EAC include high upfront connection costs, the high mobility of inhabitants, lack of physical addresses, land tenure issues, high costs of internal household wiring and insecurity in some of the areas. However, a high willingness to pay for electricity services can be assumed, as slum dwellers spend more than average tariff on alternative energy sources, like dry cells, candles and kerosene.

Apart from these obstacles there are also challenges to utility-based grid expansion to urban poor that are related to policy and regulation, financing and institutional capacity. Policy does not require utilities to achieve a 100% connection rate of customers in a distribution area. On the financial side existing mechanisms to finance energy

infrastructure are inadequate in covering the cost of connection and wiring. Moreover, low-income households are unable to manage their variable/inconsistent incomes to afford monthly tariff. On the institutional side the managerial and operational capacity of utilities is insufficient to expand connections quickly and at low cost. Inflexible payment mechanisms tend to exclude very poor households with erratic incomes.

The physical conditions, i.e. the built environment of informal settlements, make safety and maintenance of infrastructure extremely difficult. Additionally, low levels of awareness about grid safety and grid maintenance requirements persist. The widespread expansion of grid distribution in informal settlements requires to be commensurate with cross-sectoral programs to manage the influx of new inhabitants, as well as in development of other urban infrastructure, including water and sanitation.

The EAC Regional Strategy for Scaling-up Access to Modern Energy Services comprises both a regional level intervention and national level interventions.

The regional level intervention has the following key elements:

- Regional policy harmonization: Assisting member states to review and develop future oriented energy access policies.
- Capacity building at national and regional level: Building the institutional capacity of key public and private sector institutions that will have regional impact.
- Strategy Implementation support: Assisting member countries to develop investment programs.
- The Strategic coordination and program management: Developing a regional strategy to inform and support national strategies.

The national level intervention has the objective to:

- Mainstream energy planning into budgetary processes,
- Build national capacity to support the role of private sector and communities in enhancing effective energy service delivery,
- Develop pro-poor energy policies and strategies, including financing and support programs, e.g. soft loans, grants etc., and to
- Identify and promote suitable business models.

Both levels of intervention are accompanied by a financing strategy. The total capital expenditure to cover the scaling-up of existing business models and introduction of new

business models is estimated to be USD2.7 billion with USD1.6 billion for end user contribution and USD1.1 billion for subsidies by government and development partners.

The support required to trigger capital expenditure is estimated at approximately USD556 million, which includes USD217 million from development partners' program support, USD291 million in loan guarantees by development banks and USD48 million from the EAC.

Currently, national baseline reports and work plans have been developed, a regional implementation plan has been established, including plans for increasing the capacity in the EAC and a proposal for national level implementation structure. Moreover, a donor conference was held and the commitment was gained for the initial support of the program.

4.6 Challenges and risks in universal provision of electric energy in informal settlements in South Africa – *Mr. Maboe Maphaka, ESKOM Distribution, South Africa*

Maboe Maphaka presented about the South African experience of Eskom in rural and urban mass electrification, the historic context of the endeavor, the pre-payment system used by Eskom and the lessons learnt during implementation of the system.

Eskom is one of the top 10 energy utilities in the world by generation capacity. It is among the top 11 by sales and generates approximately 95% of electricity used in South Africa and 45% of electricity used in Africa. It is state owned and regulated through the National Energy Regulator. Eskom has about 32,000 employees and over 3.9 million customers. It sells annually approximately 218,120 GWh with an installed net maximum capacity of about 37.7 GW. Eskom is currently running out of generation capacity and is busy with a major Generation Capacity Building Program.

Eskom started its mass electrification in earnest in the late 1980s to early 1990s, through the campaign *"Electricity for All"*. This was a few years before the first democratic elections took place in South Africa in 1994, and after facing a severe loss of total distribution energy during the years before. Immediately after 1994, South Africa experienced an increased rural-urban migration from within South Africa, and from the neighboring countries. The consequence was an immediate housing problem and

mushrooming informal settlements near all major cities. Today, city administrations view electrification as an important aspect of the formalization process. Eskom is also hard at work electrifying the rural communities in collaboration with the South African Government to fuel rural development, with the hope that this will reduce the need for mass migration to the urban areas.

Apart from generation capacity shortages, many other challenges and risks were encountered. Many of the areas where potential customers for electricity supply resided had almost no infrastructure in place. No fixed addresses existed, no bank accounts and no postal services. The unemployment was high. Many customers had difficulties in understanding the bills. A culture of non-payment of services had prevailed for a long time. Meter tampering and energy theft as well as infrastructure vandalism were regularly detected. Access problems existed and the low consumption levels resulted in long payback periods of any infrastructure. This made it impossible for Eskom to provide a "normal service offering".

Mitigation strategies included the re-design of electrification network infrastructure in order to reduce costs per connection. Eskom works closely with national and local governments to proclaim some of the informal settlements for electrification and other infrastructure services including roads, water and sanitation. The prospects of "Energization" were investigated in areas where electrical infrastructure was non-existent, especially in rural areas, but also with emphasis of social security that provides "Free Basic Services".

Mitigation also included the introduction of prepayment metering and vending technology, which evolved from a basic prepayment and vending system to the modern on-line-vending and split metering. More revenue protection audits were introduced to mitigate energy theft. The approach was refocused lately in line with the implementation of a holistic Energy Losses Management Program (ELMP), which also incorporates community involvement, now, in dealing with the problem of energy loss management and infrastructure theft and vandalism.

The main objective behind the prepayment strategy is to reduce the risk of consumption without payment and the improvement of the cash flow.

The conventional vending system, which was the starting point in South Africa, was characterized by:

- High shortages
- Under-banking
- Reconnaissance problems
- High fraud risk
- High revenue losses and
- Ghost CDU's (Central Distribution Units).

Compared to the traditional credit vending, the up-front vending provides significant advantages, including up-front banking, reduced financial risk exposure, the automated energy unit's top-up and an easy reconnaissance process.

Online vending provides additional advantages, like for instance the greater convenience, real time transactions, electronic banking and reduced risks and reduced costs. Prepayment gives the customers a daily visibility of consumption and is thus enabling improved budgeting for each household.

Problems during implementation of the prepaid vending system in South Africa were associated with:

- Meter tampering and vandalism,
- The database integrity, which slows down the system update,
- The lack of real time or near real time data,
- The integrity of sales, i.e. data corruption,
- The loss of cash from vending stations that are poorly secured,
- The shortage of skilled prepayment staff in the country,
- The potential rejection of prepayment system by customers,
- The lack of revenue management skills,
- The inability to measure energy delivered to all towns, settlements and customers accurately.

Despite all obstacles, the prepayment system by Eskom is regarded as a great success in the provision of modern, clean and reliable energy services to the urban poor in South Africa.

4.7 Energy access policies in peri-urban areas of West-Africa: the case of Senegal – *Ms. Touria Dafrallah, ENDA Third World, Senegal*

Touridia Dafrallah presented an international study that has recently been completed on Modern Energy Access in Peri-Urban Areas of Senegal. The objective of the study was to identify challenges and policy options in order to facilitate improved, clean and sustainable Energy services to the poor living in urban and peri-urban areas in developing countries, from the perspective of poverty alleviation, productive use of energy and environmental protection. This presentation did focus on the case of Senegal as one of the seven countries that were part of the study.

Background

The study was carried out within the framework of the Global Network on Energy for Sustainable Development (GNESD), a Type II initiative started during the World Summit on Sustainable Development (WSSD) in Rio de Janeiro. The GNESD consists of 20 centers of excellence located both in the North and in the South. Seven centers took part in this study, including Senegal, Kenya, South Africa, Brazil, Argentina, Thailand and India. This presentation focused on the case of Senegal. Seven peri-urban areas have been studied, which were all at different locations with respect to the main city center, Dakar. 280 households and 70 businesses were studied regarding their situation of energy access, i.e. the availability, accessibility, affordability, acceptability and use of energy.

Key findings

The energy profile found is a middle ground between rural profile & urban profile. It includes modern forms of energy, like electricity, LPG (cooking), but also traditional forms of supply like wood & charcoal for cooking and kerosene for lighting. Generally, a transition from traditional sources of energy to clean and modern energy types has been observed. As mentioned the extent of the transition depends on many factors: availability, accessibility, affordability and acceptability of the form of energy service in question.

Access takes place through legal and illegal connections. No correlation between electrification rate and distance to the grid could be found, nor between financial capacity and access. Existing high rates of electrification were observed, possibly hiding the significant reliance on illegal connection. The lack of financial means that leads to informal settlements in the first place does also lead to illegal connections to the power

grid. These connections are more likely to be suspended (between 50-100% depending on the area) than underground (comparing to 25-50% depending of the area).

52% of households do actually pay a connection fee for illegal connections while 48% do not pay. Payment is mostly done in families for reasons of solidarity. The actual proportion varied among the areas surveyed. The average connection fee has been found to be between USD8-45.

On average 12.5% of the households use electricity in businesses, while 80% of businesses are informal and rely on illegal connections through neighbors. The connection fee for informal businesses is similar to that of households. Payment depends either on an agreed sum or on the equipment type being installed.

Four major barriers to modern energy access in the peri-urban Dakar were identified:

- *Barrier 1*: The lack of a proper definition and understanding of the real characteristics of peri-urban areas, which means an institutional gap,
- *Barrier 2*: Land tenancy issues and illegal settlements entail illegal power connections,
- *Barrier 3*: The prohibitive connection cost for households located far from the grid (> 30 kilometers) is up to USD650,
- *Barrier 4*: The inappropriate channeling of LPG subsidy and its progressive withdrawal by the government.

Policy recommendations can be developed in response to these main barriers:

***On Barrier 1*:** The lack of proper definition and understanding of characteristics of peri-urban areas could be overcome through the mobilization of a consultation framework and forum. Consensus could be reached among all involved actors around the definition and a proper delineation of the peri-urban zones. A database of the locations of Peri-urban settlements could be developed based on GIS and remote sensing. The confusion between urban and peri-urban areas must be removed. Specific needs of peri-urban areas in transition from a rural to an urban energy profile must be determined, not at least to help defining targeted policy intervention for peri-urban zones.

***On Barrier 2*:** To provide access to electricity largely means legalizing grid connections. The slums occupancy status needs to be formalized, organized and upgraded in order to

help poor peri-urban households to have formal access through a legitimate utility account. The level of access to legal electricity needs to increase, since the existing tariffs provided by the utilities is more advantageous than the tariffs paid for illegal connection via neighbors *(Example USD2.4/month vs. USD1.5/month for a 4W bulb (4h/day and USD0.25/Kwh).* A good practice that is already applied in this respect consists in delivering a temporary Id card for the Peri-urban residents to make them eligible to open legitimate accounts with the power provider.

***On Barrier 3*:** Access to electricity means also to alleviate high upfront fees, which are to be paid in cases where peri-urban households are far from the power grid (>30 kilometers) or where additional extension work is necessary. Payment of the connection fees can also be arranged through long-term installments that can be afforded by the peri-urban poor. The installments could be included in the electricity bill. Governmental budget could be mobilized in order to contribute to the additional grid extension cost.

Barrier 4 was not discussed, since its cause lies outside the focus of this current workshop.

Electricity-based income generation is also an important aspect of access to electricity. The development of productive applications for electricity and small-scale productive units should be promoted. Small businesses providing cold beverages, meat and poultry conservation etc. could help to generate enough income to cover the electricity cost.

Financing mechanisms for these applications, such as micro-credit schemes, where the households would get together in a network to fund their own enterprises in turns, are needed. An information campaign can show the benefit of productive applications and its possible use as a means to afford the electric bill and can therefore support the policymaking.

In conclusion, Touridia Dafrallah mentioned areas of further research, which could include:

- Possibilities for the development of small peri-urban energy producers or entrepreneurs that will generate and supply energy on site to the peri-urban poor at an affordable cost,
- An in-depth investigation of the safety aspects of illegal connections and the implications for the peri-urban poor,

- The knowledge sharing and partnership with GENUS.

The GNESD research presented during the workshop provided significant insights into the nature of the existing problems associated with illegal/informal connections for the power grid.

4.8 Electrification of peri-urban zones: pilot in Dakar-Pikine, Senegal – *Mr. Benoit Dome, Building Wire Manager Europe and Africa, European Copper Institute*

A close relationship exists between poverty and energy access. There is a need for quality electrification programs based on best practices to improve these living conditions. The electricity consumption per capita of Africa is among the lowest in the world. U.S. citizens for instance consume about than 20 times more electricity than is consumed in Africa on the average.

In informal settlements electricity consumption is even lower. Moreover the consumption in these high-density urban areas is typically accompanied by electricity theft. A successful intervention for sustainable provision of electricity in the informal settlement of Paraisópolis, Sao Paolo Brazil, did focus on the following elements:

- Anti-theft measures,
- Pre-payment metering,
- Improvement of safety and efficiency in the systems,
- Sustainable urban integration of the entire area,
- Awareness campaigns among residents for a change in attitude, i.e. initiate thinking about electricity use.

The issue of slum electrification in Africa needs to take into account the particular conditions that do prevail in sub-Saharan Africa. Africa has currently a population of approximately 900 million people, with 60% living in sub-Saharan Africa. The degree of urbanization is in the average 40% out of which between 38-90% are peri-urban (informal settlements). The annual growth of informal settlements is 4% on average. Poverty in many cases effectively prohibits the legal access of households to electricity. Developing cities tend to disintegrate into areas of wealth and poverty. The supply of electrical power does usually not coincide with the actual demands in terms of capacity.

At the same time, most MDGs are linked to electricity. Energy efficiency in Africa is clearly identifiable and improvements are significant and realizable.

Many newly built (informal) urban areas are irregularly connected to the power grid. However, the non-conforming users are wasting perhaps 50% of their electricity through energy inefficiency. The consumption is on average 128kWh per household/year. The quality of service could be improved and the total consumption of electricity in an area could be reduced, if regular access will be developed for every household.

Why a pilot project initiated in Dakar? Dakar represents a manageable zone representative of the many and varied prevailing conditions. Dakar and the Pikine District are large enough to provide benchmark data. They are neither most nor least affluent. The conditions to be found here can be found throughout sub-Saharan Africa.

The program aims at energy efficiency, including:

- New transformers to enable extra distribution,
- Installing efficient final distribution,
- New poles enabling efficient access to households,
- New circuitry and households being earthed externally,
- Energy efficient bulbs replacing the current ones,
- New energy efficient fridges (from Class G to Class A).

Including all measures it is possible to save 46% of the energy consumption (in kWh) with a comparable Quality of Service. On the side of the utility a better Demand Site Management is possible, including the reduction of non-technical losses (fraud) and better payment collection.

The prices paid by customers for electricity are far higher in Senegal than compared for instance to Brazil, the US or the EU. The prices paid for informal connections are the highest. Savings of up to 68% are possible through the change from non-conforming (informal) to conforming type of connection, as well as through increased efficiency and subsequently reduced consumption. A significant reduction in CO2 emissions also goes along with increasing efficiency.

The program also aims to set up a recycling structure to absorb the replaced equipment, including old refrigerators, cables, lamps etc.

The program improved electrical safety, leading to reduced incidents of electrical shock and electrical fires. It improved reliability of supply, improving food quality and reliability of operations for small businesses relying on electricity. It improved energy efficiency and reduced greenhouse gas emissions. Social outcomes of the program include the contribution to re-integration of the respective peri-urban settlements into the urban fabric, the improvement of health conditions due to the use of cleaner energy sources as well as education.

A potential for CDM projects exist, because for the improvement of existing infrastructure and the reduction of CO2 emissions. Financing can also involve micro-finance schemes and revenue collection from recycling goods.

4.9 Good practice examples of small scale sustainable energy projects – *Ms. Carmen Dienst, Wuppertal Institute for Climate, Environment and Energy (WISIONS), Germany*

Carmen Dienst presented results from the WISIONS initiative, which was founded five years ago by the Wuppertal Institute with the financial support of the foundation ProEvolution. WISIONS has supported more than 45 energy related projects in DC&EC.

The WISIONS initiative was built based on the knowledge that the access to clean and affordable energy is vital for achieving the MDG, including the reduction of poverty and health risks, as well as for sustaining the future security of energy supply.

Although increasing attention is given to renewable energy in the political arena and promising examples do exist, the implementation is often hindered by the lack of technical know-how, co-operation and by financial and social barriers.

There is a need to foster more innovative and sustainable energy projects (renewable energy as well as energy efficiency), especially on smaller scale and to promote knowledge transfer on good practices.

The WISIONS objective is to combine spreading knowledge of existing successful good-practice projects with programming the realization of new project ideas.

In the first four years WISIONS focused on two approaches:

- The Promotion of Resource Efficiency Projects (PREP),
- Sustainable Energy Project Support (SEPS),

Currently a Technology Radar is being developed that shall provide knowledge on existing and promising renewable energy technologies for DC&EC. It will be linked to basic energy related needs and present not only technology solutions, but as well the economic, social and environmental aspects, so that a transparent view of their sustainability can be given.

For the selection of the projects promoted under PREP and supported under SEPS, a major criterion is the sustainable character of the project. This includes the technical and economical feasibility, the marketability and replicability, the existence of a sound implementation strategy, social and gender aspects and employment potential. For PREP it was especially the innovation in solving market and technological challenges.

Under PREP, a series of 12 brochures has been published, that include 4-5 good-practice examples to showcase successfully implemented projects, their benefits, financial aspects and lessons learned. The topics and the target groups varied on periodical basis with the objective of addressing a wide range of issues (Resource efficient construction; Energy and water; Sustainable Transport; Sustainable Tourism; Microfinance and Renewable Energy; Energy in Schools; Corporate Energy and Material Efficiency; Sustainable Biofuel Production and Use, Energy and Sustainable Food Processing; Energy and Poverty Reduction; Solar Cooling; Water for Energy and Energy for Water).

In the last five years in total 47 sustainable energy projects have been financially supported under SEPS and are located in 36 countries around the globe (see www.wisions.net).The following three projects have been highlighted in the presentation as typical examples of good experiences that could be adopted for the electrification of urban settlements:

- Small wind power generation systems to provide clean energy in poor rural areas of Peru,

- Business opportunities with solar energy in un-electrified areas of Namibia (energy shops),
- Promoting sustainable livelihood at Lake Victoria by introducing solar lamps for night fishing.

Some lessons learned from the SEPS projects so far are that:

- Models with active participation of the users are more promising,
- The selection of partners, people and involved producers is critical before the implementation starts,
- Training of technicians as well as users is crucial (train the trainers),
- Contribution of beneficiaries (monthly rate/fee) is a basic requirement for long-term economic sustainability and to be replicable, as well as for the development of ownership.

Most of the SEPS applications did not focus on urban settlements. Reason for the low number of applications for this kind of projects is the fact that a lot of organizations and project developers in renewable energy technologies are not yet working on the problems of urban areas. This is also related to the fact that up to now less emphasis has been laid on the support of urban RE projects. There's a variety of small-scale renewable energy technologies that can be used for both electrification of rural areas and also for informal settlements. So the experiences made within many rural projects could be helpful for urban communities and should be shared among the different stakeholders. So one crucial thing is the knowledge exchange on successful models as well as on technologies that could lead to a fruitful development of new solutions for urban settlements. WISIONS is trying to emphasise this exchange in the new technology radar to be published in 2010.

4.10 Electrification for the urban poor in Uganda, experience and coverage plans – *Eng. M. Murengezi, Adviser to the Chairman, Energy and Mineral Sector Working Group, Uganda*

Eng M. Murengezi presented on upcoming initiatives on slum electrification in Uganda that particularly seek to involve the private sector, and power companies to get involved in the low-income urban market of informal settlements.

The population in Uganda is about 30 million people with a growth rate of 3.2% and approximately 20% or six million living in urban areas. The majority of people live in informal settlements. Uganda is mainly an agricultural country. Agriculture is a key activity even in urban areas. The national electricity coverage is about 12% with 40% in the urban areas and 6% in the rural areas respectively. There is no data available for the coverage of informal settlements.

Uganda's power sector is heavily privatized with all generation of power and the distribution under private hands or under long-term lease contracts for operation. Only the transmission is under a public company, the Uganda Electricity Transmission Company Ltd. (UETCL). The power sector is regulated by the independent Electricity Regulatory Authority (ERA).

Uganda has paid little attention to electrification for informal settlements. More attention has been given to rural electrification. Uganda has many slums and they are growing every day. Electrification is usually part of slum upgrading attempts with limited success, since the informal settlements are often just moved and the problem is shifted. In Uganda informal settlements develop often in wetlands where there is land available. Others emerge on railway reserves or river flood plains.

Uganda's electricity is very expensive - an equivalent of 22US cents per kWh – it is hardly affordable to inhabitants of the informal settlements. At the same time, informal settlements are also known for high losses, where access is provided. Electricity is consumed for home use including music, TV and fridges, and for small businesses, like for instance selling drinks, hair dressing, welding, grain milling and food processing.

It is very important within the frame of slum electrification to understand the stakeholders of informal settlements. Electricity transforms people. It is a catalyst for development. In that process the inhabitants (the dwellers and their landlords) are the most important stakeholders. Electricity is also a service that is likely to be delivered by politicians. Security has to do with the availability of lighting. Public service provision, including hospitals, schools and libraries require electricity. Water supply and agriculture and last but not least entertainment needs electricity, too. There are various stakeholders with an interest in and with a position on the issue of slum electrification.

Uganda has included slum electrification as part of the national coverage plans and also as part of rural electrification. Current plans include the use of Global Partnership Output Based Aid (GPOBA). The water sector is ahead of electricity at the moment, having used GPOBA to cover many slum areas. The water providers begin by mapping out the cities and identifying poor areas in urgent need. For electrification, GPOBA is a partnership model where private sector providers partner with governments to use connection subsidies to poor people in rural areas and urban slums. The target is to connect at least 200,000 homes in the period of two years. Beneficiaries will be unconnected homes in areas which have been electrified in the past 18 months. The investments will be about USD15 million. Additional costs shall be shouldered through micro-finance institutions.

The main challenge remains high tariffs and losses. Strategies focus on bulk metering and prepayment schemes for electricity, and on measures of energy efficient lighting.

In conclusion one can say that electricity is a necessary input into economic activities in informal settlements. Electricity transforms people and the lives of the people can improve with electricity. Uganda has so far done little for slum electrification but major plans are under way based on Public Private Partnerships under the GPOBA to benefit slum electrification. National connections are to be accelerated to target poor communities. Tariffs remain the challenge but are being addressed.

4.11 Energy demand challenges in slum areas: the case of Kibera, Nairobi

– *Eng. Jared Othieno, Regional Manager, Western Kenya, Kenya Power and Lighting Company*

Eng. Jared Othieno reported on the Kibera Slum Electrification Project and the experience of the Kenya Power and Lighting Company.

The population at Kibera is estimated to be about 750,000 people on an area of approximately six square kilometers. There are about 300,000 electrifiable households and billing takes place for a total of 2.1 GWh against 5.2 GWh of restricted load. The actual revenues are around KES2 million against an expected KES5 million.

Beginning in 2007, the Phase 1 and Phase 2 of the Kibera Slum Electrification Project targeted 11,000 customers. Up to date, only 3,367 customers have paid out of which 2,611 were connected.

Households are connected over central metering points inside the area (supply via low voltage overland lines) that are also equipped with load limiting devices in order to prohibit tampering and electricity theft. Each transformer or central metering point is restricted to a radius of approximately 300 meters. The electricity is used for both domestic purposes and in micro and small enterprises of the informal sector.

The high costs of connection fees are clearly the main barrier for non-connection to KPLC (up to 69% of the inhabitants have stated that in a survey). Only 10% of the expenditures are spent for electricity from the local supplier, while 48% is spent on kerosene and 21% on small batteries as sources of energy. Currently, 54% of the energy expenditures are spent on cooking and heating, 29% is spent on lighting and 17% on audiovisual. Other competitive sources of energy include candles, firewood, charcoal and LPG. It is also the objective of any slum electrification project to challenge these market shares.

Socio-economic factors affect the energy demand in Kibera. There is a dynamic shift from households to businesses. Cultural practices and lifestyles at the places that people originate from have an influence as well as the compartmentalization of Kibera into ethnic and economic groups. Local providers coerce and threaten potential customers. The goal of slum electrification is not in congruence with the interests of tenants and landowners.

Additionally, barriers come from the technical equipment currently in use. The installed load meters suppress the natural load growth. Pre-payment metering would provide load growth freedom but would also mean a large cost outlay.

Next steps could include:

- Engagement of social scientists to complement marketers in market surveys,
- Use of an integrated approach to inform on load growth pattern.
- Analytical methodologies for qualitative analyses of socio-economic drivers of energy demand.
- Campaigning for tariffs that can benefit both slum users and the utility.

- Analytical methodologies to measure receptivity of slum dwellers to the slum electrification programs.

4.12 Household energy use combinations and connectivity to the electric power grid in low income residential estates in Kenyan cities – *Prof. Kingiri Senelwa, Moi University, Kenya*

Prof. Kingiri Senelwa presented the results of a recent survey on energy use pattern in low-income settlements undertaken by the Moi University in Kenya. The research provided insights on fuel and energy types in use, their mix and use combinations, the related expenditures on energy and energy services, the willingness and ability to pay and the problems of accessing electricity.

The specific objectives of this research were to:

- Identify energy use and fuel mix in low-income households and the associated socio-economics.
- Assess the levels and the proportion of households that were connected, and to
- Identify factors influencing connectivity of households to the electric power grid.

For the survey 18 low-income residential areas in three Kenyan cities were sampled.

11 areas were surveyed in Nairobi, including Mukuru Kwa Ruben, Mukuru Kayaba, Dagoreti corner, Mathare, Embakasi village, Kibera, Kawangware, Kayole corner, Soweto, Gachie and Mukuru Kwa Njenga. Three areas were in Eldoret, including Langas, Huruma, and Munyaka. Four areas in Kisumu were surveyed - Kondele, Nyalenda, Manyatta and Kaloleni.

In each estate, plots and households were identified, indeed one household from each plot. The respondents were mostly household heads. Besides energy a number of other features were subject to the survey, including the nature of the houses, the materials used in construction, the size of the house, the type of kitchens, cooking spaces and facilities, and the cooking appliances in use. Regarding the energy mix and use combinations the most important question was on the particular type of energy source, the supply logistics, as well as the drivers and barriers for grid connection.

A total of 541 households have been sampled, 250 in Nairobi, 181 in Eldoret, 110 in Kisumu. 100%, 75% and 92% of the respondents in Nairobi, Eldoret and Kisumu were renting (mostly a single 10x10 meters room per household). The housing structures varied from permanent to semi-permanent using various building materials. Interestingly, in the target group more households in Kisumu (38%) and Eldoret (36%) were connected to the grid (comparing to 21% in Nairobi). The average household size in Nairobi was the smallest with three (comparing to 3.5 in Eldoret and four in Kisumu). The mean monthly income was the highest in Nairobi with 1747, while the income in Kisumu (1723) and Eldoret (1697) was slightly below. Also in terms of income bracket Eldoret was among the poorest. 25% of the respondents reported not to be employed (casual or not).

Different types of fuels were in use in all estates. Kerosene (for lighting and heating) and charcoal (heating and cooking) were the most common fuels. Dry cells were most prominently used in electronic gadgets (e.g. radio) and hand held spotlights. Electricity use for lighting and electronics was lowest in Nairobi. LPG was used only in a very limited way due to higher costs. Firewood was also not used intensively because of restrictions given by landlords and also because of its limited availability. Reused car batteries were the main source of electricity for TV sets and radios. Some households also installed solar panels to operate TVs and radios. The most popular combination involved kerosene, charcoal, dry cells and electricity (formal or informal connections).

Energy is an indispensable budget component in households. On the average, households spend about 26% of their monthly income on energy with a maximum of 34% and a minimum of 15%. The amount spent on energy in total was found to be increasing with monthly income; however, the relative amount was highest with the lower income group. This means that the lowest earners spent relatively more on energy than higher earners. Access to affordable energy can have an impact on households' living conditions.

Most of the respondents who were not using electricity from the grid as a source of lighting were willing to switch to superior energy or fuels. This group of people is currently paying as much as KES730 per month. That means there is a willingness and capacity to pay for electricity for lighting and for electronic gadgets. The problem is access to electricity.

The barriers to accessing electricity from the grid include:

- The nature of the settlement, being too far away from the grid,
- The opposing objectives of the landlords, who often also sell kerosene or provide the service of charging cell phones, but do not anticipate a grid connection,
- Financial aspects, indeed the comparable high upfront costs for the grid connection as well as the need for regular periodic payments, which does not coincide with irregular income; moreover, most of the consumers are not aware of their budget lines.

The following conclusions can be drawn from the survey:

1. A mix of modern and traditional sources of energy was used in all of the estates and households, indeed mostly kerosene, charcoal and dry cells.
2. Kerosene, charcoal (and dry cells) were the base energy / fuel type in all estates and households using a significant proportion of the residents' monthly income and posing a risk to safety and health that most of the residents are unaware of.
3. Fuel substitution is a common desire for all residents, but high costs of connections for electricity and LPG plus the costs of appliances is a major hindrance to connectivity and accessibility.
4. The irregular nature of incomes for a proportion of residents (casuals, un-employed) is a hindrance. Most residents resort to charcoal and kerosene which can be purchased in smaller quantities in close proximity of the households, and is often available at all times.

4.13 Access to energy in peri-urban areas of Kenya using community power centers – *Mr. Felix Kiptum and Mr. Paul Njuguna, UNIDO, Kenya*

Felix Kiptum and Paul Njuguna presented on a recent initiative of UNIDO with the title and aim to "Lighting up Kenya". The idea of Lighting Kenya is to use locally available renewable energy sources to produce energy for these areas. The energy is generated with the help of community power centers for domestic use and productive applications.

Lighting up Kenya utilizes locally available renewable energy resources to produce Energy for areas without access to electricity. Energy is produced and made available at Community Power Centers (CPC) for domestic use and productive applications.

CPC is a common energy facility using available energy sources to produce and provide electricity and energy services. UNIDO model CPC use locally available renewable energy resources to produce electricity. In an area where there is grid power, the CPC can use local electric grid power.

Lighting up Kenya has three main areas of intervention. It is focusing on the clean energy technology, including micro-hydro, anaerobic digesters, biomass gasification, wind and solar and bio-oil. A second arena focuses on productive activities and business development regarding small and medium size enterprises, community development centers, ICT and internet development, access to e-government facilities, promoting the use of LED and CFL. Thirdly the initiative focuses on social empowerment, improving the livelihood, additional job creation, health benefits improving ICT literacy levels. Renewable energy technologies are thereby seen as a means for productive activities. The community power center can facilitate such activities and also create additional livelihood.

Community power centers are an appropriate way to go. In peri-urban areas affordability is a major impediment to access. For a common facility, costs of production, connection and maintenance are shared. The services provided are therefore becoming affordable. At the CPC the use of electricity for productive activities is the main focus, since the CPC is designed to be a profitable facility. A community produces and uses only the energy they require and can expand them organically as needs increase. The size of PCP can be scaled depending on need and available investment.

A practical example is the use of energy efficient LED lamps to replace kerosene lamps. CPC, which are currently established in Kenya, are located in Ngong, Kiambu, Machakos and at the Wema Centre in Mombasa.

4.14 Electrification for slum/low-income settlements in Liberia: opportunities and challenges – *Mr. Hady Sherif, Center for Sustainable Energy Technology, CSET, Liberia*

Hady Sherif presented recent experiences in slum electrification of low-income settlements in Liberia. He highlighted opportunities, challenges and lessons learned from a program that provided electricity to urban poor in a country that has been stricken by civil war for

almost one and a half decades with significant destruction in the power supply infrastructure and a significant informal urban growth as a result of the war.

The total geographic area of Liberia is 111,370 square km of which 96,320 square km consist of land area. The population of Liberia is about 3.476 million. The total number of households is approximately 670, 295. The population of Monrovia is a little over one million (30% of the total population), almost double the size as compared to the time before the war. The population density of Monrovia now exceeds 1500 inhabitants per square mile. The drivers behind the rapid urbanization in Liberia are mainly the rural-urban migration, displaced population and returnees who may be unwilling to resettle in their respective rural homes. This may be increasing the number of slums or informal settlements in Monrovia.

There has been no special national electrification plan or program whether pre or post war targeted at slums and informal settlements in the country. The pre-war electricity generation capacity was 412 MW, of which 191 MW was from the national utility, the Liberian Electricity Corporation (LEC). A single hydropower plant previously provided the largest fraction of generation capacity. Most of the energy service infrastructure, including power plants, transmission lines, fuel storage tanks and depots were destroyed in the war. Upon the inauguration of the first post-war democratically elected government in 2006, the Emergency Power Program (EPP) was launched.

International partners such as USAID, the EU, Ghana, Norway and the World Bank provided over USD40 million for this program to revive the electricity sector of Liberia. Presently, LEC's generation capacity is 9.6 MW. Nationally, only less than 5% of households have access to electricity (8% of urban households, in Monrovia its about 10% of households).

The Liberia Energy Assistance Program (LEAP), a USAID-funded supplement to the EPP was implemented between 2006 and 2007. Under this program, an urban community development pilot project was implemented and was aimed at providing electricity access to two low-income urban communities in Monrovia. 200 low-income households were to be electrified as well as schools, health facilities and other institutions in the selected communities. Only 127 plots were actually electrified and these include residences, institutions and small businesses. Streetlights were also installed in the pilot

community. The remaining 73 structures will follow soon. The delay, according to the LEC has been the low capacity of its sub-station in one of the pilot areas.

The following approach was taken: The implementation of the USAID-funded LEAP Urban Pilot Project involved various stakeholders: The national Ministry of Energy, LEC and the International Resources Group (IRG). Sub-contractors included Smyser Associates and CSET (a local energy NGO), the pilot community leadership as well as the beneficiaries themselves. This approach was unique and unprecedented in Liberia as it involved donor, government, the utility, NGOs and beneficiary communities in a partnership. Prepayment electricity meters were used to connect the pilot beneficiaries. Each stakeholder had its own role to play based on his or her institutional relevance and expertise.

CSET engaged the community through focus groups discussions and research. A socioeconomic survey was done to determine the ability and willingness to pay. A technical survey complemented that knowledge by insights on suitability of structures and the right way forward. CSET also conducted an awareness, sensitization, and education campaign on energy efficiency and conservation in the pilot communities. With a connection fee subsidized and financial assistance from the donor, CSET coordinated the wiring upgrade of structures. Each pilot beneficiary agreed to pay labor cost for wiring or re-wiring.

The national utility, LEC, did the pilot design and built the distribution system, trained the pilot communities' electricity vendors, and installed the entire prepayment system including the meters at both the main station and the homes of the beneficiaries.

The main contractor and management of the IRG provided technical support, while the government through the Ministry of Energy gave its acquiescence. Beneficiary communities as well as the pilot community organization provided their cooperation and support, while direct beneficiaries paid the labor cost for structure wiring.

Challenges included the official recognition of the existence of slums or informal settlements and incorporating or integrating their electrification in national plans and programs. Issues of tenure in slums and informal settlements must be solved. Risks factors and issues involved with informal electrification must be eliminated. Such communities are living largely with makeshift structures and power theft is also a

common factor there. Financial viability is also still a challenge. Cost of providing service in such areas must be harmonized with revenue expectations and the ability of the beneficiaries to pay. It should be the objective to include the access to electricity into the package of social services that governments try to extend to slum areas or informal settlements.

The merits of this project include the improvement of economic and social conditions, indeed the quality of life, poverty alleviation, improvement of security, increase in commercial activities and budgetary or fiscal discipline by the beneficiaries (pre-metering). Beneficiaries today are paying less for the legal connection as opposed to illegal services and inefficient traditional energy sources. The increase in number of customers means an increase in revenues, while minimizing the rate of power theft. Moreover the program means promoting universal access to electricity with reference to the National Energy Policy, Liberia's Poverty Reduction Strategy (PRS), ECOWAS' regional policy on energy access for urban and peri-urban populations and last but not least the Millennium Development Goals (MDGs).

The following lessons learnt can be formulated from this project:

- The collaboration and involvement of various stakeholders proved to be a worthwhile approach for electrifying slums and low-income settlements in Liberia, however, an appropriate exit strategy will be required.
- The payment process should be simple and easy for customers, and so must be the connection process. Electrification program design for slums surely differs from other cases, e.g. the electrification of a middle class estate. The condition prevalent in slums and informal settlements are different from formal settlements.
- National utilities must endeavor to study best practices used in other countries with the aim of adopting innovative approaches to improve effectiveness and efficiency and hence to attract more customers including the urban poor for sales and revenue maximization.
- Subsidies and other forms of finance by governments and donors could also help increasing electricity access to the urban poor. The governmental support towards a dedicated electrification program for the urban poor will be essential.

In conclusion one can say that electrification of low-income urban communities improves the social and economic conditions of the inhabitants which is consistent with numerous policy documents including national energy policies, PRS, ECOWAS and the

MDG. The top-level governmental support through policy, strategies and action plans is indispensable to any electrification program for low-income urban areas. Utility's flexibility is necessary in studying and applying best practices suitable to local community conditions. A collaborative effort (including Government, Utilities, NGOs, CBOs, etc.) proves relevant to the process.

4.15 Access to basic services in shanty towns, Casablanca, Morocco – *Mr. Christophe Cluzeau and Ms. Zeinab Benchakroun, LYDEC, Morocco*

Christophe Cluzeau and Zeinab Benchakroun presentation focused on LYDEC's programme for urban infrastructure services in Casablanca, Morocco. Electrification of peri-urban settlements is part of LYDEC's approach. However, it is carried out as only one element of a more integrated and comprehensive attempt of bringing public services or service infrastructure to the urban poor.

LYDEC is the Morocco Public Service Company in Casablanca. It is responsible for various public services delivery and infrastructure development for water supply, wastewater disposal and sanitation, electricity distribution and street lighting. The related delegated management contract started in 1997 and will run for 30 years.

Greater Casablanca today has about five million inhabitants. 20% of them are living in shantytowns. Typology-wise three different forms of slums or shantytowns can be distinguished in Casablanca. There are urban slums, largely informally developed on previously vacant plots in the inner-city area. Secondly, one can distinguish rural shantytowns, which are free standing peri-urban settlements in the outskirts of Greater Casablanca. Moreover, many of the urban areas within the metro boundaries can be regarded as informal, i.e. non-compliant with existing legislation or the formal town planning. Nevertheless these areas are not classical slums since the population living there is not necessarily stricken by poverty.

Prior to 2005 governmental interventions did follow two main approaches. The first one was the relocation of slum dwellers to off-site social housing estates composed of medium to high-density multi-storey walk-ups. The second approach was to relocate slum dwellers to off-site land plots, i.e. so-called site-and-service plots, where basic infrastructure has been provided, but no actual housing. The first one was

predominantly rental accommodation, while the second one emphasized self-help/self-built solutions.

In 2005 the National Initiative for Human Development (INDH) was unveiled containing three main axes:

1) Access to infrastructure and basic social service,
2) Stable income activities,
3) Focus on very poor people.

It was the understanding that effective and sustainable development can only become a reality by means of integrated public policies.

After 2005 a new step was taken, indeed the on-site (in-situ) upgrading of existing settlements. 85,000 households were provided with basic service infrastructure, whereas 75,000 households, mainly from the inner city were relocated to social housing or site-and-service plots. All together 159,000 households in the Greater Casablanca Area got access to water, sanitation and infrastructure.

Electrification prior to 2005 was provided through main low-voltage lines operated by LYDEC, which then were equipped with collective meters for smaller neighborhood networks managed and operated by intermediaries providing household connections, individual meters and circuit breakers. The collective meter was positioned outside the non-authorized area (the informal settlement or slum). Private networks with individual meters were inside the non-authorized area. The local intermediary was in charge of the customers' management. Water supply was provided based on local authority decision. No national policy existed and subsequently no legal base for any intervention in areas where the urgent need for water and sanitation was. Connection costs were the main barrier for intervention. The result was that prior to 2005 only 30,000 households got connected to electricity and about 10,000 households got connected to water supply. However, through these interventions a good understanding was developed of social, planning and political context in low income areas. The first steps were prepared for the INDH-INMAE project.

In contrast to the approach taken prior to 2005, INDH-INMAE incorporated the following principles:

- Household connections to electricity, water and sanitation services (at the same time),
- Subsidized infrastructure and networks through contractual cross subsidy and public finance,
- Customer rules adapted (e.g. the "household without formal status" became a possible client),
- Social tariffs were implemented for beneficiaries, as well as a
- Dedicated low-income customer support.

In summary the social tariff rate amounted to 20.70 EUR per month altogether for water, sanitation and electricity. Over the period of two years 85,000 households were connected. The amount of 120 million EUR has been invested during this time.

Main barriers were the lack of decisions by local authorities regarding relocation off-site or an on-site upgrading, for restructuration plans, for beneficiaries lists, for land tenure to construct infrastructure. Moreover, the stakeholders program has been delayed and an initial deficit of EUR50 million existed.

Despite all obstacles, it has been shown that improvements and access to modern urban service to such an extent as 85,000 households are in fact possible and can be realized within two years, if:

- A real government commitment exists,
- Social tariffs are an integral part of the solution,
- Strong partners exists on the side of civil society, including NGOs and CBOs,
- All activities are implemented under a maximum of transparency to the general public, as well as to all stakeholders that are directly involved in the program,
- Clear tendering procedures and solid project documentation is maintained throughout the process.

Sustainability can be achieved through an integrated approach that includes service provision (water, sanitation and electricity), but that also covers other relevant topics like land tenure and property regularization, housing and the improvement of building infrastructure, as well as the social and economic development of an area. Projects can be implemented through a partnership between the state, public utilities and civil society.

It has been essential for the success of the program that, based on participative managemen,t a vision has been jointly developed and implemented, indeed to create a dignified living space, to improve the quality of the urban environment, to support collaborative projects, to have a sustainable customer relationship and to maintain a safe network environment.

4.16 Philips efforts in off-grid solutions for urban areas – *Mr. Mohamed Dagher, Philips Lighting, Egypt*

Mohamed Dagher of Philips Lighting Egypt introduced a new range of solar lighting products developed by Philips Lighting within the framework of the Sustainable Energy Solutions for Africa initiative.

Sustainable Energy Solutions for Africa (SESA) is a Dutch government Public Private Partnership initiative, regionally linked to Sub-Saharan Africa. The aim is to help in providing sustainable lighting, cooking and water purification solutions for areas where huge numbers of people have no access to main grid electricity.

Philips role is to develop and sell affordable products that people need and want. Moreover, Philips supports main distributors and develops and undertakes new business models that are all based on the company's core competences.

Partners include typically the governmental departments, like the Ministry of Foreign Affairs, as well as NGOs that are active in the field of development. All partners together will provide and fund the process of inclusive market development. This will include awareness creation, entrepreneurial training, finance mechanisms support, program and country project management.

The objective of SESA is to provide 10 million people in sub-Saharan Africa with affordable, appropriate and sustainable energy solutions by 2015. As part of this aim, Philips is announcing important new product lighting solutions. It has recently signed up to a new global initiative launched by UNEP and GEF to accelerate the uptake of low-energy light bulbs and efficient lighting systems. The Platform aims to reduce electricity consumption in developing economies. It is also aimed at replacing fuel-based lighting systems, such as kerosene, which can cause health-hazardous indoor air pollution.

The most important new products and sustainable lighting solutions shall be briefly introduced:

Solar Street Lighting Aurora (Fortimo): This is a fully solar-powered streetlight that is functional in areas without grid based electricity. It provides up to 20 hours light between the charges. Each system effectively lights an area of 32m times 8m with high light levels of 3-7 lux from a 6 meters height. The light is a high quality white light of RA >70. Aurora uses long life LED with low maintenance costs. Two settings are available, the first is the "Dusk to Dawn" mode and the second is the "Evening mode". The energy management allows for a longer lifetime.

Aurora updates: Updates are to be released by Miribel and is expected to be first marketed in November 2009. The updates will have 25W and 1800 lm fixed output. A bigger 4500lm version is also expected by the end of 2009.

Dynamo Multi LED Torch & U Day: These are smaller and portable devices, which are either based on a PV element or on a hand-driven dynamo. The mini-UDay is a solar lantern that contains a battery and is recharged with the help of a PV element. A new generation of lanterns is currently being developed.

The Solar Reading Light (SRL): The design concept allows reading and writing in the same time. The SRL is powered by 1 lo-pw LED and an IP55 solar-charging panel. It can be placed on top of a page for reading or writing and emits an even light onto the working space of the desk.

Moreover, Philips offers a range of fixed home lighting solutions or Solar Home System (SHS). The key Challenges in Launching the Solar Range were to guarantee premium quality, affordability, a strong distribution network and after sales services, for example the batteries replacement.

ANNEX 1: WORKSHOP AIDE-MEMOIRE

Introduction

Current patterns of energy production, distribution and utilization are unsustainable, and there are wide disparities in the level of energy consumption within and between developed and developing countries. One third (2 billion people) of the global population has no access to basic energy services. Most of them (1.6 billion people) live in developing countries, mainly in South Asia and in Sub-Saharan Africa. They depend on inefficient biomass fuels, such as wood, animal and crop waste for cooking and heating, which have detrimental effects on air quality and health. About three-quarters of the world's commercial energy is consumed in urban areas, and many of the people in direst need of access to modern energy systems are located in rapidly growing informal urban settlements (slums) throughout the developing world. Despite such numbers, the energy needs of poor urban households, and particularly of women, in developing countries have not been properly addressed, as development efforts have focused intensely on the rural poor.

Access to affordable, modern energy services is a pre-requisite for sustainable development and poverty alleviation and, more specifically, for achieving each of the Millennium Development Goals (MDGs). Lack of access to reliable, safe and mostly environmentally-friendly energy is a strong constraint on human development.

To encourage and support the design and implementation of energy-access programmes and projects for the urban poor worldwide, UN-HABITAT established the Global Energy Network for the Urban Settlements (GENUS). This is a dynamic new partnership and collaboration with multiple institutions and stakeholders, including the public and private sectors, governmental and non-governmental organizations, grass-roots groups, national and international development agencies, working in the urban energy sector. GENUS aims to provide world-wide exchange and dissemination of best practices and technologies, awareness creation, capacity-building, advocacy, tools development and knowledge management.

GENUS is a global programme structured geographically to operate in Asia, Latin America and Africa. It addresses three key themes of energy access for the urban poor,

namely (i) Improved urban mobility for the poor; (ii) Slum electrification; and (iii) Energy from waste.

The Expert Group Meeeting – *Slum electrification: challenges to be addressed*

It is widely assumed that precisely because the urban poor reside in the cities of the world that they must have no energy needs or challenges at all. But nothing could be further from the truth. Even if there is availability of electricity in urban areas, this does not automatically translate into accessibility by the urban poor. UN-HABITAT recent studies show that urban poor and especially slum-dwellers are particularly hard hit by lack of access to modern energy. In part due to poor infrastructure and prohibitively high up-front costs, the poor often face much higher energy costs than the non-poor. They pay more for their cooking, water and electricity than wealthier people connected to the service networks.

Cities in developing countries require a rapid increase in energy production and consumption to accelerate economic development, alleviate poverty and meet the basic needs of their populations. Urban areas offer special opportunities and need thus special attention. They are a hub for economic development and high population density offers possibilities for good economics in terms of electricity access. The current political/environmental agenda in many of those countries is still fragile, and different challenges constrain the capacity of city managers to conceive and design appropriate programs and policies in support of energy access for poor urban settlements.

The Meeting will bring together key agencies, institutions and stakeholders involved in urban energy issues in Africa. It will provide an in action-oriented forum for the exchange and integration of various best practices, lessons learnt and perspectives represented by the experts, into the development of a programme of action for improving energy access for the urban poor in Africa. Among other issues, the Meeting will address lessons learned and best practices within the continent in terms of how utilities and public authorities have, in selected instances, been able to bridge the gap between the ability to pay for monthly service and user fees and the upfront costs necessary for connection to the grid and proper metering.

The Meeting will form the basis of the launch of the GENUS network and programme of work on Slum Electrification in Africa. A similar consultation workshop was held in May 2009 in Asia with a focus on access to transport for the urban poor. A consultation leading to the establishment of GENUS in Latin America with a focus on Energy from waste will be held in the early part of 2010. The series of workshops will culminate in an inter-regional meeting to mark the formal launch of GENUS as global platform on access to energy for the urban poor.

Outcomes

- Developing an understanding of key issues, challenges and opportunities for addressing access to electricity in informal settlements in Africa.
- Mapping of key stakeholders in Africa to be enjoined in the emerging GENUS partnerships and networks.
- Broad agreement on the structure of the GENUS network in Africa.
- Identification of potential anchor institution for GENUS activities in Africa.
- Broad agreement on a comprehensive operating plan and objectives of the GENUS in Africa.

Venue

The Expert Group Meeting will be held on 26, 27 and 28 October 2009 at UN-HABITAT Headquarters in Nairobi, Kenya (Conference Room 10).

How to register

Contact the Meeting Secretariat for additional information on **genus@unhabitat.org**
Registration is free.

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GLOBAL ENERGY NETWORK FOR URBAN SETTLEMENTS (GENUS)

Expert Group Meeting on
Promoting Energy Access for the urban poor in Africa
Approaches and Challenges in Slum Electrification

Nairobi, UN Headquarters
Conference room No. 10
26-28 October 2009

ANNEX 3: PROGRAMME

Day 1 – Monday 26th October

Opening		**Chair/facilitator**
9.00-9.45	Opening speech – *Ms Inga Bjork-Klevby, Assistant Secretary-General and Deputy Executive Director of UN-HABITAT* Welcome address – *Mr Jared Othieno, Kenya Power and Lighting Company* Keynote speech – *Mr Patrick M. Nyoike, Permanent Secretary, Ministry of Energy, Government of Kenya*	*Graham Alabaster*
9.45-10.00	Expert Group Meeting overview, objectives and expectations – *Peter Njenga, UN-HABITAT*	
10.00-10.15	Tea/coffee break	
Session 1: *Promoting energy access for poor urban settlements in Africa - Overview*		*Sara Candiracci*
10.15-10.45	Overview of slum electrification (Global vs. African Experience) – *Connie Smyser, Smyser Associates & UN-HABITAT Consultant*	
10.45-11.00	Questions/Plenary discussion	
11.00-11.15	An overview of private sector interests and needs for infrastructure investment in Africa – *Joel Kolker, Public Private Infrastructure Advisory Facility (PPIAF)*	
11.15-11.30	Lighting Africa Initiative – *Arthur Itotia Njagi, IFC Advisory Services, World Bank Group, Kenya*	
11.30-11.45	European Union Energy Initiative - Partnership Dialogue Facility (EUEI-PDF) – *Michael Franz, GTZ*	
11.45-12.00	Increasing access to modern energy services for the urban and peri-urban poor : the EAC Energy Scaling up Initiative – *Paul Kirai, Integrated Energy Solutions, Kenya*	
12.00-12.30	Questions/Plenary discussion	
12.30-13.30	Lunch	

Session 2: ***Promoting energy access for poor urban settlements in Africa – Case studies***		*Peter Njenga*
13.30-13.45	Challenges and risks in universal provision of electric energy in informal settlements in South Africa – *Maboe Maphaka, ESKOM Distribution, South Africa*	
13.45-14.00	Energy access policies in peri-urban areas of West Africa: the case of Senegal – *Touria Dafrallah, ENDA Third World, Senegal*	
14.00-14.10	Video on " The problems facing access to electricity in Pikine peri-urban area, Dakar, Senegal", presented by *Adiouma Dione, PROQUELEC, Senegal*	
14.10-14.20	Electrification of peri-urban zones: pilot program in Dakar-Pikine, Senegal – *Benoit Dome, Copper Benelux, Building Wire Manager Europe & Africa, Brussels*	
14.20-14.35	Good-practice examples of different small-scale sustainable energy projects under WISIONS initiative – *Carmen Dienst, Wuppertal Institute for Climate, Environment and Energy, Germany*	
14.35-15.00	Questions/Plenary discussion	
15.00-15.15	Tea/Coffee break	
15.15-15.30	Approaches to electricification of informal settlements in Uganda – *Moses Murengezi, Ministry of Energy, Uganda*	*Vincent Kitio*
15.30-15.45	Energy demand challenge in slum electrification: Kibera slum electrification project – *Jared Othieno, Kenya Power & Lighting Company*	
15.45-16.00	Household energy use combinations and connectivity to the electric grid: the case of low income residential estates of Kenyan cities' – *Kingiri Senelwa, Moi University, Kenya*	
16.00-16.15	Access to energy in peri-urban areas of Kenya – *Paul Njuguna & Felix Kiptum, UNIDO, Kenya*	
16.15-17.00	Questions/Plenary discussion	
17.00	Closure Day 1	

Day 2: Tuesday 27th October

Session 3: ***Promoting energy access for poor urban settlements in Africa – Case studies***		*Connie Smyser*
9.00-9.15	Recap of day 1 and overview of day 2 – *Peter Njenga, UN-HABITAT*	
9.15-9.30	Electrification for slum/low income settlements in Liberia: opportunities and challenges – *Hady Sheriff, Center for Sustainable Energy Technology, Liberia*	
9.30-9.45	A management model for electricity, water and sewage provision to slum areas in Casablanca, Morocco – *Zeinab Benchakroun and Christophe Cluzeau, LYDEC, Morocco*	
9.45-10.00	Philips efforts in off-grid solutions for urban areas, *Mohamed Dagher, Philips Lighting, Egypt*	
10.00-10.30	Questions/Plenary discussion	
10.30-10.45	Tea/Coffee break	
Session 4: ***Global Energy Network for Urban Settlements (GENUS): structure and a programme of work***		*Peter Njenga*
10.45-11.00	Global Energy Network for Urban Settlements: objectives, structure, operational principles and plan – *Peter Njenga, UN-HABITAT*	
11.00-11.45	Break-out working groups on: 1) GENUS governance structure *(Facilitator: Connie Smyser)* 2) GENUS operating plan & financing *(Facilitator: Peter Njenga)* *3)* GENUS communication strategy *(Facilitator: Sara Candiracci)*	
11.45-12.30	Plenary discussion: framing of key issues	
12.30-13.30	Lunch	

13.30-14.30	Break-out working groups on potential pilot work: *1)* Prioritize key overarching issues on slum electrification that can be GENUS pilot work *(Facilitator: Peter Njenga)* 2) Draw an indicative list of possible pilot projects to be considered by GENUS *(Facilitator: Sara Candiracci)*	*Connie Smyser*
14.30-15.00	Plenary discussion: framing of key issues	
15.00-15.15	Tea/Coffee break	
15.15-16.00	Establishment of an interim steering group	*Peter Njenga*
16.00-16.10	Briefing on field trip	*Sara Candiracci*
16.10-16.30	Workshop wrap	*Peter Njenga*
16.30	Closure Day 2	

Day 3: Wednesday 28th October

9.00-13.00 hours: Visit to Kibera slum electrification and related projects.