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Conference report

Powering Africa: helping energy infrastructure investment deliver growth and connectivity

Wednesday 13 – Friday 15 April 2011 | WP1105



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The key objectives of this conference were to unite in an informal round-table setting policymakers, donor communities, development finance institutions (DFIs) and entrepreneurs to find solutions to the urgent need for energy infrastructure investment in Africa that would lead to strong, sustainable socio-economic growth. Participants acknowledged the need for new thinking after decades of stalemate and failed projects. Africa's predicament is one of 600 million people without access to energy: huge financing is needed to attempt to meet projected growth in demand.

Key points

In recent years, the African continent has started to undergo a quite dramatic image transformation. The continent of famine, war and despair is slowly but surely emerging as a promising investment destination for investors of all kinds. Some observers have thus raised the potential of an "African renaissance," even going so far as characterising the continent as the new BRIC.

While these developments are encouraging, there also remain significant hurdles for strong economic growth to take hold and to deliver sustainable and widespread benefits for African countries and their citizens. One such significant hurdle is a lack of crucial infrastructure, especially in the energy sectors of African countries.

In particular, there is an urgent need for new thinking to attend to the 600 million people without access to modern energy services in Sub-Saharan Africa.

To extend access, all key stakeholders – African governments, development finance institutions, development partners and the private sector – need to be mobilised and to cooperate more proactively. Encouraging and enabling stakeholders to cooperate requires a strong focus on transactions and common ground. The following key issues were identified:

- A clear regulatory, legal and institutional environment is essential to tackle the access challenge. Regulatory reform needs to have a much clearer pro-poor focus than in the past.
- Energy market liberalisation should be pushed ahead where appropriate: often private sector participation will lead to greater efficiency, but a transparent enabling environment combined with strong government capacity needs to be ensured first.
- Innovative solutions to combat financing shortfalls exist which involve catalysing DFIs, donors and the private sector to take risks and support local bottom-up approaches. However, good project preparation is key: DFIs and development partners need to do a better job in coordinating the multiple existing financing facilities and making them more easily accessible.
- Stakeholders need to keep an open mind with regard to energy infrastructure technology: off-grid or mini-grid decentralised solutions using renewable energy are proving increasingly suitable for extending access in a cheaper, more sustainable way than conventional solutions.

- Regional cooperation and power integration needs to be stepped up to benefit from economies of scale and comparative advantage as well as South-to-South knowledge sharing.
- The political drive to promote access to modern energy services should not come at the expense of environmental sustainability. A sustainable energy mix can be achieved through cost-effective renewable energy schemes or hybrid schemes that combine renewable and conventional energy forms.
- Carbon finance is still too complex to benefit most African countries. The existing Clean Development Mechanism (CDM) is in urgent need of reform. Further capacity development especially among local investors in Africa is required.
- Bottom-up approaches that aim to foster local entrepreneurship as well as fundamental technical maintenance skills are essential to achieve lasting socio-economic growth.

Recommendations for different stakeholder groups

During the conference, various key recommendations for all stakeholder groups emerged.

DFIs should:

- Have a bigger role to play following the global financial crisis in bridging the financing shortfall created by the scarcity of commercial bank lending.
- Review their frequently too conservative approach to risk assessment: the mission and vision of the *development banks* need to be aligned with actual lending practices.
- Assess their financing product toolbox, especially with a view to enabling more investments into smaller-scale on-grid as well as off-grid energy access projects. This could include:
 - more long-term local currency loans to reduce foreign currency exposure;
 - enhanced collaboration with local commercial banks (e.g. through credit facilities);
 - better integration of financing with technical assistance to make projects sustainable.
- Further support regional energy integration projects, including through financing of interconnection capacity as well as targeted technical assistance (e.g. on harmonisation of regulatory frameworks).
- Enhance customer orientation by curbing bureaucracy and fostering collaboration among DFIs to reduce transaction costs in project finance.
- Support simplification of the rules for carbon finance.

Development partners should:

- Prioritise and support renewable energy in their support strategies.
- Review financing tools and modalities for support to energy sectors in Sub-Saharan Africa: the singular focus on grant finance limits the scale of energy infrastructure finance available and may also send wrong policy signals. That applies in particular to some of the former Heavily Indebted Poor Countries (HIPC) that have undergone substantial economic transformation during the past decade but that require infrastructure investment on a massive scale.
- Coordinate themselves better and collaborate more often, e.g. by financing joint initiatives to promote access to modern energy services in Sub-Saharan Africa. The United Nations' International Year of Sustainable Energy for All in 2012 provides an excellent opportunity to join forces rather than launch separate programs.

- Assess the potential to provide financing based on results in both access goals achieved and emissions avoided (e.g. through support to feed-in-tariff systems).
- Support the training of the local community and finance local entrepreneurial energy projects.
- Be selective by providing grants predominantly for capacity development in good regulatory, legal and institutional environments in Sub-Saharan African countries.

Private project sponsors should:

- Take more risks. Private equity in particular needs to attribute less importance to the internal rate of return and more to project-design risks.
- Consider new energy business models for investment in Sub-Saharan Africa, especially as it pertains to off-grid solutions based on new technologies.
- Build partnerships with local developers in African countries, both to allow for knowledge- and technology transfer as well as to allow for upscaling of project models.

Governments in Sub-Saharan Africa should:

- Continue with regulatory reform in their energy sectors, with a specific view to fostering access to modern energy services (pro-poor focus).
- Set ambitious yet realistic targets for fostering access to modern energy services, integrated with their power sector investment planning.
- Set feed-in tariffs at appropriate levels to attract investor interest, for example by setting them by way of bids.
- Couple feed-in tariffs with standardised power purchase agreements (PPAs) to guarantee transparency for independent power producers (IPPs).
- Streamline public agencies involved in the sector to minimise bureaucracy.
- Support regional integration of power markets through efforts to harmonise and standardise regulation.

1. A bleak outlook but room for optimism: some figures

In Sub-Saharan Africa today there is a huge need for energy infrastructure investment, to achieve both broad-scale access to energy as well as sustainable long-term economic growth. The outlook appears bleak: as many as 600 million people still live without access to modern energy in the region, which represents 75% of its total population. Currently, there are only 27 independent power producers (IPPs) for the entire continent, which is far too little to match demand. There are also huge disparities across Africa. In South Africa, the level of consumption per person is 6000kWh per year, in Uganda it is 70kWh per year, whereas in Chad it is 10kWh per year. In most of Sub-Saharan Africa, more than 90% of primary energy demand is covered through biomass (in particular charcoal and kerosene), a considerably unsustainable and unhealthy form of energy. To provide access to modern energy services for all of Sub-Saharan Africa, the Africa Infrastructure Country Diagnostic (AICD) estimates that a total of US\$40 billion per year would need to be invested over the next 20 years.

But there is also room for optimism. 93% of Africa's natural and renewable energy resources remain untapped, compared to one third in North America. This applies in particular to hydropower. Also, many new projects have sprouted in East Africa and the Great Lakes region in recent years, whose quality and scope are increasing quickly. In Kenya, for example, increasing investment in generation, transmission and distribution allows the national utility to connect m

ore than 200,000 new consumers per year. It is also worth emphasising in that context that the drive for electrification takes time: in Europe it took 60 to 70 years from the beginning of electrification to delivery of remote access in the countryside. Current estimates show that in Sub-Saharan Africa it will be possible to sustain

outreach to 1 million new consumers each year for up to 10 to 15 years, at least for peri-urban electrification.

It is clear therefore that there are substantial opportunities for bringing light to Africa. But new thinking is needed that takes the specificity of Africa's circumstances into account, considers advances in technology and links growth to energy infrastructure investment. The benefits of access to power for human development bear reminding: health, education, quality of life, and commercial and productive activity.

2. The state of infrastructure investment in Africa's power sector: lessons and opportunities

The international debate on access to modern energy services tends to focus on on-grid solutions. And indeed, estimates suggest that at least half of the challenge in Sub-Saharan Africa lies in extending on-grid access to power to people.

The current state of grid-connected power infrastructure in Africa and its need for development can be assessed on several levels. The first is financing. For many project developers, obtaining credit remains highly difficult due to Africa's narrow financial markets and limited access to international financial markets. Thus far, the project finance model is not working effectively in the region: for example, even if the Bujagali hydroelectric power project in Uganda can be considered a success, it took more than 15 years to complete.

Many development partners – multilateral as well as bilateral – are criticised as being ineffective: their financing tends to go to governments, creating opportunities for embezzlement, rent-seeking, and poorly planned and poorly implemented projects. Capital more often than not needs to fly directly into the private sector in order to facilitate quality projects in due time.

In addition, both the private sector as well as DFIs often demand excessive certainty and are unwilling to take risks. This may explain the recent success of Chinese investment in Africa: the Chinese demand less certainty and proceed with project implementation quicker than their Western counterparts. Some speakers noted that risk is often wrongly calculated: it should depend less on the back-end (i.e. risk related to the internal rate of return (IRR)) and more on the front-end in project preparation, which includes feasibility studies and tariff and procurement law assessments. Project preparation may well be more important than funding.

The second major factor, perhaps more important than financing, is the regulatory and legal framework present in African countries. A key point is the degree of liberalisation of energy markets and the unbundling of the generation, transmission and distribution segments. In Uganda and Kenya, unbundling is widely perceived as having been successful in attracting a large amount of private capital into the sector and has had mostly positive effects (including an increase in the share of renewable energy), but the process has also caused much confusion. In Uganda, for example, the unbundling has resulted in an atomised institutional structure in the energy sector, with unclear roles and responsibilities for key agencies. The lesson is that sector reforms take time and need to be supported by comprehensive technical assistance to make them sustainable and effective.

Some other lessons have been learned: energy generation is seen as well-suited for private sector involvement. Competition for the market has resulted in a significant increase in generation in a number of countries. However, procedures for procurement design, power purchase agreements (PPAs) and competition (for the distribution segment especially) often remain slow and unclear. For a healthy cash flow for investments in the distribution network, end-user tariffs need to be flexibly adjusted to recover costs, which in turn gives consumers a good understanding of the costs. Contracts need to have well-defined readjustment clauses to control future changes in conditions, such as political events or market fluctuations. Moreover, feed-in tariffs for renewable energy need to be set at a precise level: high enough to guarantee investor interest but low enough to avoid market distortions. The independence and enforcement capacity of regulators must be ensured to boost transparency and prevent the renegotiation of contracts, thus attracting greater

donor funding and private capital.

Regulator and government capacity is a third important determinant factor for energy infrastructure investment, specifically in the context of attempts to attract private sector investment, either through IPPs or PPPs. There is a lack of skills and understanding in handling bids, enforcing contracts, collecting revenue and providing legal certainty in many Sub-Saharan African countries. This is compounded by overly bureaucratic and frequently corrupt government structures. To combat this there need to be skills-building initiatives, focused in particular on national regulators but also on other relevant government entities.

3. Regional power integration: the role of African power pools

Regional power pools are likely to play an important role in strategies to foster access to modern energy services in Sub-Sahara Africa, though they have been slow to develop.

In Sub-Sahara Africa, energy has been at the forefront of regional integration. The largest existing regional power pool is the Southern African Power Pool (SAPP). It has been largely successful and represents tremendous potential for development of renewable energy that could replace coal and nuclear power in southern Africa. But as South Africa is the major player in the SAPP, it tends to set the rules; this raises issues on the sustainable evolution of the power pool. If Eskom (the South African public power utility) continues to restrict its outlook by not providing provisions for imports from other countries, the potential for further integration is very limited. The physical infrastructure for exchanging power exists, and there has been some progress in creating the necessary institutions for trade.

Good regional power integration depends on a number of other factors. Regional integration, economies of scale and investor interest are interlinked. Bigger, 'lumpy' investments in a larger power plant than is needed for a single country can occur if interregional transmission lines exist for power trading, since often the national market is too small, and serious financiers and investors are attracted by bigger projects. Incidentally, the Mozal aluminium smelter in Mozambique would not have been possible without electricity from Eskom. DFIs have a role to play here in facilitating the structuring and financing of big integration projects. Harmonisation among regulators and governments, along with the sharing of expertise and skills, can contribute greatly to the streamlining of project implementation at the national and regional levels. In some areas power pools exist, but trading has not occurred as governments have not allowed sufficient freedom to regional pan-national groups. Furthermore, it is important for all participants to see a common interest in the integration, as is the case in the Nordic common electricity market for instance, and to ensure that third-party wheeling charges are correctly reimbursed.

4. A sustainable energy mix: renewable and cost-effective energy for the future

Africa has a huge potential for renewable energy, but financial, technological and environmental consideration need to be balanced to ensure a sustainable energy mix. In particular, it is unclear whether renewable energy can be made as cheap as energy from some fossil fuels, especially coal. Coal is high output, cheap, but high-carbon and attracts little development finance; solar energy on the other hand is low-carbon and can attract much financing, but is low output and expensive. However, it some speakers also observed that small-scale coal power generation is generally unstable, and requires advanced expertise not often found in Sub-Sahara Africa. Also, many countries do not have indigenous coal reserves. These countries would therefore be dependent on expensive and unreliable imports. Renewable energy from wind and hydro are therefore competitive with coal in terms of costs on a small scale.

To avoid negative environmental impacts from broad-scale access to modern energy, there needs to be long-term thinking. This means making sure projects are in line with regulatory standards, standardising contracts across countries with proper internalisation of the carbon footprint, and employing results-based financing

for both energy access and emissions reduction. Donors have a role to play in entering into dialogue with countries interested in low-carbon development strategies, but also in supporting sustainable energy businesses more often since the effects will last longer than they would for direct donations to governments.

The energy mix is crucial for both cost efficiency and sustainability. To this end hybrid power schemes that combine renewable and conventional energy could be a viable option. Wind and hydropower (since wind strength is inversely correlated to rain), or gas and solar can often be combined for a better result than a single-energy scheme. The share of natural gas has increased considerably in the power sector, with significant new finds. It remains the cleanest of the fossil fuels and may be cheaper and quicker than hydropower. One idea is to combine gas and hydropower, with hydropower taking over in the few months that rain is very strong. There is not yet a clear picture of natural gas's potential in Africa.

Finally, the option of solar water heating needs further exploration. In theory, and with sufficient regulation, every new household could be fitted with solar water heating, as in new households in Israel.

5. Delivering access to modern energy services: the challenge of rural and off-grid electrification

Access in rural areas of Sub-Saharan Africa is still dismally low: according to some estimates, only roughly 10% of households are currently connected. Some specific challenges exist in extending universal access. Upfront capital costs are usually high, local banks lack capacity to act as financial intermediaries, and returns on investment for the private sector are usually low. Rural electrification projects are complex, and there is often a lack of talent capable of preparing, implementing and maintaining ventures.

What can DFIs and the private sector, as well as tools such as mini-grids and small-scale energy technologies offer in overcoming such barriers to the delivery of universal access?

6. The role of the private sector in promoting universal access: on-grid versus off-grid potential

Market-oriented reforms were supposed to result in an expansion in private sector investment in energy in many parts of Sub-Saharan Africa, including investments focused on access to energy and rural electrification. Indeed the opening-up of energy generation to private sector competition has served to increase overall generation and reduce costs in a number of countries, as noted above. However in other areas private investment has been absent or limited and in many countries little improvement has been made in service delivery to the poorest people. A big overhaul in the thinking behind market liberalisation is required to ensure proposals are pro-poor and actually deliver reliable modern energy services.

Private sector funding through project finance needs to be sustained for the development of large power projects in order to provide capacity for growth in power demand as well as access in peri-urban and rural areas. However, providing generation capacity does not automatically translate into access. Grid electrification is not synonymous with universal access. In fact, only 40% of the new generation capacity required for universal access by 2030 is by grid extension, meaning off-grid solutions must be given much more consideration.

One particular issue for off-grid projects is capital or 'smart' subsidies: in regions where they were provided, they typically constituted 70-80% of total investment. However, such subsidies may have been put to better use as part of credit facility funds that the private sector could secure investment loans at relatively low interest rates. Credit facility funds have shown some promise in enabling access to cheaper loans. Other strategies include rewarding companies willing to invest in rural areas, by letting them pay less for bulk electricity than operators servicing urban centres for example. Even so, rural consumers are often still too poor to pay first connection costs, meaning that public intervention in the form of connection subsidies and

credits may be needed.

A promising alternative for private sector investment in rural areas is in renewable energy projects that couple feed-in tariffs with PPAs that correspond to specific technologies. Feed-in tariffs minimise transaction costs and PPAs ensure transparency regarding tariffs for IPPs. In this case, upfront subsidies to cover initial capital costs are not needed: the performance-based incentives of the automatic readjustment of feed-in tariffs provide a revenue stream that can help secure financing and offset financing costs.

Private equity can learn from this too. Often investors attach too much concern to the IRR of projects, and grant financing is seen as essential for small-scale projects. But to solely rely on grants and subsidies would be a mistake. Indeed, there is an abundance of venture capital looking for double digit returns that can and should be encouraged to invest in rural electrification projects with the idea of recovering capital costs later, having stimulated economic growth and lifted consumers' incomes. Entrepreneurs should be encouraged to take risks without resorting to subsidies or waiting for a reasonable IRR.

7. The role of DFIs in promoting universal access, especially for off-grid solutions

One precondition for more investment in access to modern energy services is the availability of capital at acceptable terms and conditions in Sub-Saharan countries. In the past, local capital markets have proven to be shallow and local commercial banks have been unable to meet the demand for long-term finance at competitive interest rates.

DFIs can play a key role here by providing credit enhancement and credit facilities to ensure local banks can provide attractive financing packages for energy project developers. In the context of support to on-grid power projects, such credit enhancement and credit facilities are not new. In fact, many DFIs have garnered significant experience during the past decade with such financing tools. However, thus far, few (if any) DFIs are providing financing for off-grid power projects. It may help if the mode of financing matches the technology: off-grid systems are likely to be best financed by micro-finance, mini-grids by corporate lending, and main grid extensions by project finance.

Lastly, DFIs usually wield considerable influence on government policy, and can advocate policies concerning the development of isolated grids, especially ones based on renewable energy. It is important to press for a simplified regulatory framework especially for rural electrification, and for a review of any imposed country-wide tariffs as these preclude investments in local isolated grids that may yield higher, but affordable tariffs, compared to rates by the national utility. Consumers are often able to pay for electricity that is directly associated with the costs they would avoid from a more expensive energy source (kerosene for example).

8. Mini-grids and small-scale technologies: a strong potential for delivering access to remote areas

Mini-grids and household systems are an alternative to grid-based power systems and also hold the potential for providing people (especially rural populations) with access to modern energy services. Indeed often grid extension is not the best or most efficient solution for rural areas: initial investments needed are too high, competition would occur with investments in infrastructure in urban areas, central power generation is too low, and installation of additional capacities takes years.

The advantages of mini-grids or household systems are manifold. Solar home systems, for example, are more flexible than grid lines and require less maintenance: women and children can be trained to install and maintain such systems which, also empowers them. Solar panels are cheap enough to be mass-produced locally. Suppliers need to ensure good quality batteries and storage facilities - this often means importing from developed countries at a higher cost, and there is still a lack of

local understanding regarding storage. But as mentioned earlier, the economic and social impact of such basic energy is substantial. Mini-grids using hydropower, diesel, solar or hybrid systems, and household systems employing solar energy and rechargeable batteries are a viable alternative to conventional forms of energy. Small-scale off-grid solutions can also take the form of energy kiosks, which bring together lighting, a food outlet, communication and energy recharge functions in one package.

As costs in the solar sector are generally initially high, conventional subsidies or cross-subsidies, combined with the provision of outlets potentially, are needed to buy down the upfront capital costs. End-users having to pay the full cost of the service at some point need to understand the costs involved. To facilitate this consumers could have some initial flexibility (with a wind-charged battery for example), allowing them to balance their consumption with their income, and then upgrade to a more permanent system. Throughout this process of moving the consumer up the value chain, consumer protection is fundamental. This can be helped with quality standards, an after-sales service, and a warranty system.

An alternative way of enabling low-income consumers to pay prices that recover costs is a financial package that combines a household energy system with micro-finance. Poor households could reallocate money previously spent on high-carbon kerosene to pay off a micro-loan over 5 years, for example, for a clean solar home system.

No single model is required: solar energy in one area can be combined with mini-grids in others; a micro-utility whereby one entrepreneur loans energy to a small community can be adopted; and if the main grid is extended solar energy can be sold back into the grid. While mini-grids may well be easier to connect to the main grid at a later stage, off-grid single-user applications are seen as a benefit in poorer areas since they allow greater independence and empowerment. As such, it is best to begin with an incubation period that tests the model on a small scale – preferably off-grid systems for less-populated areas and mini-grids for larger trading centres - with the option of then scaling up in the future.

Another key component in developing small-scale energy is stimulating local entrepreneurship, skills and an innovation mentality to sustain investor interest. The island nature of off-grid applications may work in a mini-grid developer's favour since it energises local communities to participate in small-scale projects. They can learn about servicing the equipment, collecting revenue, and selecting the right technology. It is important to be technologically agnostic: the local community is often good at working out which technologies would work best given their situation.

9. Carbon finance potential

Carbon finance should be a 'win-win' opportunity for both Sub-Saharan Africa and its investors, as a way to foster access to modern energy services while developing financially profitable projects and dealing with climate change. But countries in Sub-Saharan Africa currently make little use of carbon finance mechanisms and those projects that have been implemented have not been very successful. Capacity barriers such as lack of general knowledge in carbon finance and lack of regional and institutional coordination, coupled with financial barriers such as high start-up costs of project development and high perceived risk have impeded the use of carbon finance.

As renewable energy sources play a greater role in universal energy access, there is considerable consensus on the need for a quicker, more streamlined processes for carbon finance. The process for verification and certification of Certified Emissions Reductions (CERs) under the Clean Development Mechanism (CDM) is seen as very laborious and discouraging developers of smaller renewable energy schemes. As a solution, African governments could work together to build capacity by investing in regional training programs on carbon finance and sharing experiences. On the other hand, the international community (in particular development partners, DFIs, and the private sector) could cooperate and simplify the rules for carbon finance to render it more accessible to African countries.

Conclusion

There is room for optimism, as recent successful projects - in particular decentralised renewable energy solutions - have shown. Such optimism will be vindicated if stakeholders remain open-minded, and cooperate to achieve incremental improvements rather than perfect solutions. This would mean taking decisive action rather than talking about risk: in this regard perhaps Western actors can take a leaf out of the book of the Chinese.

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