HEINRICH BÖLL STIFTUNG

World Future Council

POWERING AFRICA THROUGH FEED-IN TARIFFS

ADVANCING RENEWABLE ENERGY TO MEET THE CONTINENT'S ELECTRICITY NEEDS

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Powering Africa through Feed-in Tariffs
Advancing renewable energy to meet the continent's electricity needs

February 2013

A Study for the World Future Council (WFC), the Heinrich Böll Stiftung (HBS) and Friends of the Earth England, Wales & Northern Ireland (FoE-EWNI).

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AREA
African Renewable Energy Alliance

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Powering Africa through Feed-in Tariffs

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Executive Summary

Africa is facing an energy crisis: the existing production capacity cannot meet the growing demand for electricity. The electricity needed to power and grow the economy, drive local development and tackle urban and rural poverty is simply not there. In addition, traditional sources have become unreliable, unaffordable or increasingly unacceptable. Energy has been described as the 'missing millennium development goal' that enables others to be achieved, yet according to the World Bank less than 25% of Sub-Saharan households have access to electricity, falling to 10% in rural areas. The traditional energy solution has relied on fossil fuels, yet not only are they becoming unaffordable, but their historic consumption by rich, industrialised nations is driving dangerous climate change. On the continent that has done least to cause it, the effects are already evident, increasing the frequency and severity of floods and droughts and impacting people's livelihoods. This has also undermined the generation capacity of one of the continent's major energy sources – hydropower, which has also come under pressure because of its negative impacts on people and ecosystems.

In finding a sustainable, affordable and reliable energy solution to meet its needs, Africa has the opportunity to leapfrog the dirty development pathways followed by countries in the global North and power its economies and its societies through renewable energy. The UN Secretary General Ban Ki-moon said in September that "Providing sustainable energy for all could be the biggest opportunity of the 21st century. Sustainable energy is the golden thread that connects economic growth, social equity, and a climate and environment that enables the world to thrive."

Renewable Energy Feed-in Tariffs (REFiTs) have been successful at increasing the use of renewable technologies worldwide. REFiTs encourage investment in renewable energy generation – from individual home owners and communities to big companies – by guaranteeing to buy and pay for all the electricity produced. As of 2012, 65 countries have implemented some form of a REFiT, driving 64% of global wind installations and 87% of global photovoltaic installed capacity. While the majority of these installations have occurred in industrialised countries, particularly Europe, the African continent has significant untapped renewable energy potential. REFiTs have the potential to transform energy systems and societies in profound and tangible ways. When tailored to the local context, they can successfully increase overall energy production both on and off the grid, boost economic development and improve access to clean energy for all while avoiding the emission of green house gases and other problems related to dirty development. Moreover, the decentralized approach of REFiTs allows for alternative ownership and governance models and provides the opportunity to empower communities as well as refreshing local democracy and self-governance.

Several African countries have already introduced the policy, and Chapter III explores the particular experiences of policy makers, private sector and civil society stakeholders in Algeria, Kenya, Mauritius, Rwanda, South Africa (which abandoned its REFiT in favour of a bidding process), Tanzania, and Uganda. Many more are either developing their REFiT or planning to, and Chapter IV similarly looks at the variety of stakeholder experiences in Botswana, Egypt, Ethiopia, Ghana, Namibia, and Nigeria. Challenges being addressed vary from country to country, as although they hail from the same continent, there is a great deal of difference between them.

The case studies include a small-island state dependent on fuel imports (Mauritius), the continent's biggest carbon polluter who is facing international pressure to reduce its emissions (South Africa), countries with less than 3% rural electrification (Tanzania), and others with almost universal access to electricity (Algeria, Egypt). This means each will have different motivations for introducing a REFiT, as well as expecting distinct outcomes. The case studies highlight how the REFiT is able to meet the variety of challenges, as well as proposing stakeholder suggestions on how it could do more.

Many of the surveyed countries face the challenge of low levels of electrification and dispersed rural populations. While this is problematic for traditional REFiTs designs, which presuppose a well-developed national grid, Tanzania has shown that REFiTs can also serve decentralised mini-grids (see Chapter VI). More than just providing clean and environmentally friendly energy, such policies also support wider socio-economic development in rural areas. Community-scale mini-grids can provide all the benefits of the grid while encouraging greater levels of democratic control and ownership over local energy systems (see Chapter V).

Africa faces other social, political and economic challenges than Europe, but our study shows that many of the REFiT design principles (explored fully in Chapter II) remain the same and can be adjusted to take account of specific country needs. Across the case studies, innovative solutions are being found to tackle broader problems that cannot be addressed through a REFiT policy alone. Project developers need access to more affordable financing options as well as locally available technical expertise for the initial design, installation and maintenance of their renewable energy power plants. Governments need to balance the need to keep energy prices low – in particular in countries with high levels of poverty – while offering sufficiently profitable tariff rates to attract private investment. Instead of passing on all costs to the end consumer, alternative sources of funding have been explored including levies on fossil fuels or international climate change funds. In some countries, the introduction of subsidies for low-income households is also being discussed to avoid additional burdens for poorer citizens.

The case studies in this book identify the drivers behind the introduction of REFiTs, present and discuss the particular policy design developed in each country and analyse both supportive and obstructive factors for a successful policy implementation. On this basis, it is possible to draw broader lessons for countries interested in developing their own REFiT:

- In order to build momentum for a REFiT policy, it is important to have high-level political support as well as buy-in from all other stakeholders. South-South learning exchanges involving ministries, utilities, regulators, financiers, project developers and community representatives have been a successful tool in this context.
- Broad coalitions involving civil society in addition to policy makers and private sector representatives have proven successful in designing and implementing REFiT policies that are resilient to changes in the political landscape.
- The success of a REFIT depends on an enabling environment. The policy should thus be an integral part of the country's wider development strategy. Awareness raising about renewable technologies in general and REFiTs in particular will help overcome scepticism. Moreover, a specific programme to build technical capacity of local companies should be implemented. A strong national value chain avoids expensive imports and provides economic benefits beyond the renewable energy sector.

REFiTs are more than just guaranteed payments for renewable energies. They can promote rural electrification, increase overall generation capacity, provide greater grid stability or aim to promote inclusive economic and social development. These objectives are of course not mutually exclusive, but policy-makers will have to decide on where their priorities lie and design the REFiT policy accordingly. As REFiTs may have to be adapted from time to time to keep up with changing circumstances, many of the following recommendations will also be of interest for countries with existing REFiT policies:

- REFiTs are complex policies and must balance overall policy goals with an incentive for investment. It is therefore important to allow all stakeholders to participate in the policy design. Special care should be taken to include civil society representatives in order to ensure that the policy meets the population's diverse needs.
- Policy makers should be very clear on the objectives they want to achieve with a REFIT. Design elements such as eligibility criteria, restrictions on plant size, differentiated tariffs by size or technology all influence which groups are likely to participate as well as the policy's overall impact and should thus be chosen carefully.
- Many renewable energy technologies have high initial investment costs, but are cheaper than fossil fuels in the medium and long term. This should be taken into account in the design and calculation of tariffs paid to REFiT project developers.
- When costs of a REFiT policy are passed on the end consumer, social transfer mechanisms should be put in place, i.e. energy-intensive users and the rich cross-subsidising affordable tariffs for low-income households. Otherwise, higher energy prices could undermine policy objectives of increasing energy access and tackling poverty.

The overall costs of project development and the lack of affordable financing options have been identified as major constraints to project implementation across all countries. These issues must be addressed to ensure that REFiTs can realise their full potential to achieve greater renewable energy deployment.

- Governments and state-owned utilities can easily help lower the costs for individual project development by providing detailed information on the country's renewable energy potential. The publication of a national solar and wind atlases informs potential investors about suitable areas and reduces the costs for feasibility studies.
- Cumbersome and lengthy administrative processes are costly, delay project implementation and discourage investors. Streamlining the licensing process through a "one-stop-shop" at a lead agency and standardised contracts should be considered to lower transaction costs. This is especially important for smaller developers and community projects.
- Credible guarantees for the power purchasing agreements under a REFiT raise confidence of banking institutions and can facilitate longer-term loans at affordable interest rates. Governments should explore how international donors and climate finance instruments could provide such guarantees, as well as funds for the wider national REFiT schemes.

Foreword

- Prof. M. M. Elmissiry -

Noble actions are many, but the most noble of them all is in the uplifting of the suffering of the masses and enabling the pursuit of a decent life. Energy poverty is widespread in many parts of Africa though the continent is blessed with enormous and varied resources of energy. It is estimated that on average about 70% of Africa' population lacks access to modern and clean forms of energy; a situation which cannot be further allowed as the population rapidly expands.

Energy accessibility varies widely across Africa; reaching over 95 % in some parts of North Africa and as low as 5% in Sub-Saharan Africa, (IEA, 2011). Energy availability, affordability, accessibility and security are fundamental requirements for any meaningful economic and social development, and requires a sound and reliable mix of energy sources.

Africa has 15% of the world's population but accounts for only 3% of the world's primary energy consumption if we exclude biomass like wood and charcoal. Electricity consumption per capita is one sixth of the world's average, with the whole of Sub-Saharan Africa only consuming as much electricity as the state of New York – far less if we exclude South Africa. The Continent therefore needs to bring about a major expansion of its already well identified energy potential. Low levels of access to sustainable modern energy throttle economic and social development. Access to sustainable forms of energy is essential for the provision of clean water, sanitation and healthcare and is central to addressing today's global development challenges. Energy access enables the provision of vital services needed for development in the form of lighting, heating, cooking, food processing, mechanical power, transport and telecommunication. More than half of Africa's people currently lack access to electricity and for more access is either unaffordable or unreliable. Such a situation calls for a massive increase in energy generation, both to existing grids and also new decentralised solutions beyond the grid, sustainably using all energy resources available to Africa to correct this grim picture and to lift millions of people out of poverty.

Energy demand in many parts of Africa exceeds supply by far, resulting in load shedding and loss of productivity, costing thousands if not millions of preciously needed jobs. Africa's population is growing at an alarming rate, increasing the demand on energy and compounding the energy shortage problems. The challenges of securing investment required to meet both the need to increase access to clean energy and the rapidly growing demand in a sustainable way are formidable. It is estimated that at least US$40 billion is needed annually in the power sector to meet future demand, which compares with a current annual investment of less than one quarter of this amount.

The world is increasingly turning its attention towards renewable energy. This transition offers an array of economic, social, and environmental advantages, and so technologies are rapidly evolving, as is innovation to adapt renewable energy systems to Africa's realities. Renewable energy is freeing national economies from the burden of petroleum purchases, creating new economic opportunities at all scales, and preserving the environment. In Africa, we are presented with the opportunity to not simply imitate the global North but to tread a higher path, one that leapfrogs the dirty development followed by so many. Renewable technology allows us to instead build a resilient, sustainable future that meets the needs of this generation and the next.

In spite of the abundant resources of renewable energy in Africa, its share of primary energy supply is less than 1% (biomass and hydro excluded).This calls for a radical change in the approach followed in the development and use of renewable energy resources. The main challenge faced by solar and wind technologies is the price gap when compared with well-established fossil fuel generators. Measures have to be taken to attract investment in decentralised as well as centralised renewable energy production – where policy attention to date has been focused – in order to mitigate the price risk gap, promote the use of renewables and answer Africa's energy needs. While renewables may face high upfront investment costs compared to fossil fuel generation, once installed the fuel source is largely free. This is where special Renewable Energy Feed-in Tariffs (REFiTs) can come in as a policy instrument that attracts investment in sustainable, renewable electricity production.

Nothing is more effective in the development of a renewable energy policy than learning from those countries that went through the same exercise, and to access their lessons learned and experiences gained.

It is my honour to write a foreword for this book which gives the valuable information required to ensure the use of the continent's abundant environmentally friendly energy resources to reduce energy poverty in Africa. The book remains accessible to non-technical readers while delving deep into a policy with the potential to transform the development and usage of renewable energy resources; namely the Renewable Energy Feed-in Tariff policy (REFiT), its various forms and how it can be implemented in the African context, with all its challenges.

Some countries in Africa have already introduced REFiTs, experiencing numerous challenges during its development and implementation. Nothing is more effective in the development of a renewable energy policy than learning from those countries that went through the same exercise, and to access their lessons learned and experiences gained. There is no 'one size fits all' and REFiTs differ in their design to incorporate the varying situations and environments. In Africa, this can be the differing severity of energy shortages, or how far the national grid extends to cover rural areas and what solutions exist beyond the grid. It is pleasing to note that this report documents such valuable experiences. The book draws on case studies from across the continent to demonstrate how the REFiT operates as a policy instrument, how it can deliver on the energy needs of African countries, how effective it is in creating a conducive environment for investment in renewable energy generation, and to offer countries with and without a REFiT access to the lessons and experiences gained – both positive and negative.

2012 is the year in which the UN Secretary General has launched the Sustainable Energy for All initiative, aiming to deliver universal energy access by 2030. Another of its objectives is to double the use of renewable energy. With the development of REFiTs in Africa as part of a comprehensive package of renewable energy policies, both complimentary goals can be met if not surpassed. The launch of this book on renewable energy feed in tariffs will hopefully go a long way towards making that a reality and UN initiative delivers on both climate and energy access through decentralised renewable energy.

Prof. M. M. Elmissiry,

Head of Energy Programme
New Partnership for Africa's Development
(NEPAD)

CHAPTER

I

Addressing Africa's Energy Challenge

Energy has been described as the 'missing' Millennium Development Goal (MDG), the catalyst without which other goals on issues such as health, education and gender equality cannot be achieved. Studies show that access to modern energy services, and particularly electricity, has a positive effect on local economic development and closely correlates to a country's UN Human Development Index.[1] from indoor cooking and kerosene causes more deaths than HIV/AIDS, malaria and tuberculosis.[2] Insufficient electricity supply also hampers economic development. A survey of businesses across sub-Saharan Africa shows that access to reliable, affordable electricity is the biggest obstacle to operations[3] (see graph).

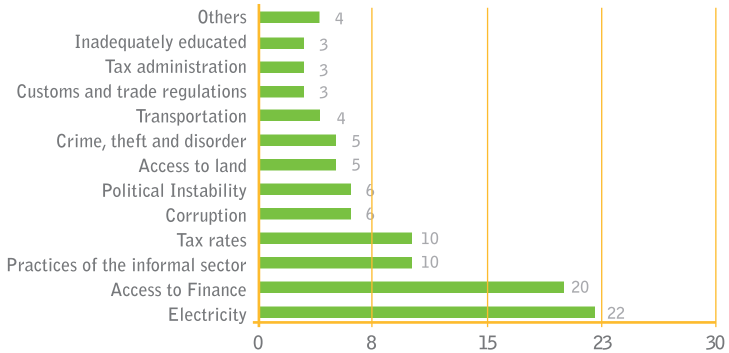

Figure I.1: Biggest obstacles to firms in SSA. Numbers rounded. Source: African Development Bank, 2012. African Economic Outlook 2012: Promoting Youth Employment, OECD Publishing.

Most countries in Africa lack the infrastructure to reliably meet the electricity demands of both its economy and its population. According to the World Bank, access to electricity for households in Sub-Saharan Africa is less than 25%, falling as low as 10% in rural areas. The vast majority of people thus continue to rely on traditional biomass and kerosene. The impact of smoke inhalation

OLD RECIPES WON'T WORK

Policy makers all over the continent - from national governments, regional organisations and the African Union (AU) – accept the urgency of the problem and have taken steps to address the energy shortage. Ambitious visions have been published, promising both

1 UNDP, 2012.

2 WHO, 2011.

3 African Development Bank (2012): African Economic Outlook 2012: Promoting Youth Employment, OECD Publishing.

a drastic increase in overall production capacity and improved access to electricity in urban and rural areas.

Traditionally, decision-makers have chosen large-scale hydropower and fossil fuel plants for electricity production and centralised national grids for its distribution. It is not surprising that these approaches also feature prominently in the newly adopted action plans, such as the AU's Hydropower 2020 Initiative. However, large hydropower projects have increasingly been criticised for their negative social and environmental effects. Moreover, prolonged droughts in recent years have made hydropower less reliable, especially during dry seasons. In years to come, climate change will lead to more extreme weather patterns, increasing the frequency and severity of floods and droughts.[4] Further fossil fuel plants would only exacerbate climate change and its negative consequences to water supply, agricultural production and overall livelihoods. Most countries would also increase their dependence on oil imports and thus make their economies more vulnerable to external shocks due to highly fluctuating international prices.[5]

ADDING RENEWABLE ENERGY TO THE MIX

The solution to Africa's energy crisis calls for new types and a better mix of energy sources. While some countries have been considering nuclear power, the promises of supposedly low production costs are no more than a myth if hidden costs and the problems of nuclear waste disposal are taken into account.[6] The recent explosion of the Japanese nuclear plant in Fukushima has also recalled the risk of accidents and their catastrophic consequences.

On the other hand, renewable energy technologies have been emerging as an increasingly viable option to complement and eventually replace traditional sources. Renewable sources such as the wind and sun are infinitely abundant and free. The technologies needed to turn them into electricity have overcome teething problems and are now being successfully employed on an industrial scale. Renewable sources currently provide 16.7% of global energy needs[7] and are of growing importance in both developed and developing economies.

Even solar PV, often considered one of the more expensive technologies, is already cheaper in many instances than diesel or petrol generators, which are often relied on for base load in rural areas, as well as bridging gaps in power production in urban areas. Recent market trends show prices have tumbled over the last decade for key technologies such as solar PV and onshore wind power and will continue to do so. Given that oil prices are expected to rise steadily, the competitiveness of renewable technologies will only continue to improve. A large share of renewables in the national energy mix will make economies less dependent on external supplies, can help stimulate local employment and can free up budget resources for other development goals.

Given the high costs of long-distance transmission lines, it is often not economically viable to connect remote rural areas to the national grid, thus cutting off these regions from the services that affordable and reliable electricity can provide, not to mention broader economic development. However, small-scale power production based on locally available renewable energy sources could overcome these obstacles. Off-grid and mini-grid solutions would not only provide clean energy, but also create local employment in maintenance and administration, as well as boosting the local economy. Local ownership and control of mini-grid solutions has the potential to transform communities

4 DARA (2012) Climate Vulnerability Monitor: A guide to the cold calculus of a hot planet, Fundación DARA Internacional. Madrid

5 ESMAP (2005): The Vulnerability of African Countries to Oil Price Shocks: Major Factors and Policy Options. The Case of Oil Importing Countries. The World Bank Group. Washington DC

6 Rosenkranz, 2010

7 REN21 (2012): Renewables 2012 Global Status Report. Paris

through increased democratic participation and quite literally handing 'power to the people'.

PROMOTING RENEWABLES

Promoting renewable energy technologies and a flexible mix of on-grid and off-grid solutions could help African countries leapfrog the dirty development pathways to the most modern technologies, avoiding the environmental problems of unsustainable energy sources and unnecessary cost of long-distance transmission lines to remote areas. Renewable technologies have extremely low operational costs and are often more cost-effective than traditional technologies in the long run. However, the initial capital requirements are often very high and thus pose an obstacle for many investors.

In order to realize the full potential of renewables, governments will have to provide an enabling policy environment, encouraging and supporting wide-spread investment. Renewable Energy Feed-in Tariffs (REFiTs) have proven to be successful policy tools in this respect. Simply put, a REFiT encourages independent power producers – companies, communities and even individual citizens – to invest in renewable energy technology by guaranteeing that all the energy produced will be bought at a fixed and profitable price. The main features of REFiTs are explained in more detail in chapter II.

The REFiT concept is highly adaptable and can be adjusted to different national circumstances and a variety of policy preferences. It can thus function well in both developed and developing countries, provided that proper care is taken in the policy design and accompanying policies. This book presents case studies of a number of African countries that have either already introduced REFiTs (chapter III) or are planning to do so (chapter IV). Special attention is given to the opportunities of mini-grid solutions aimed at increasing access to electricity in rural areas (chapter V), including a case study of the Tanzanian REFiT law (chapter VI). Lessons learned from these examples will be discussed in the concluding chapter, formulating recommendations for policy makers considering to introduce similar policies in their home countries.

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CHAPTER

II

Design Options For Renewable Energy Feed-In Tariffs

This chapter is based on the publication "Powering the Green Economy: The Feed-in Tariff Handbook" by M. Mendonca, D. Jacobs and B. Sovacool (2009), drawing mostly on examples from Europe and North America. While the principles of designing a REFiT are universal, lessons from industrialized countries may not all be applicable in other parts of the world. The case studies provided later in this book will discuss the general principles in an African context.

The main objective of all REFiT schemes is to attract investment in renewable energy generation. However, policies differ widely in the details depending on various additional policy goals. Such goals can be technical (such as the desirable number of new power plants to limit negative effects on grid stability) or social (improved access to clean energy in rural areas, etc.). Policymakers should be clear on the objectives they want to achieve with a REFIT and keep them in mind when considering the main elements of the policy. This chapter provides an overview of the most important design elements which legislators should consider when drafting or improving REFiT legislation:[1]

- eligible technologies;
- eligible plants;
- financing mechanisms;
- tariff calculation methodology;
- purchase obligations;
- priority grid access;
- cost-sharing methodology for grid connection;
- effective administrative procedures;
- setting targets; and
- progress reports.

In countries with a relatively short history of renewable energy development and those establishing a REFiT scheme for the very first time, we recommend keeping the support mechanism simple at the start. The policy should be easy to understand as REFiTs invite all parts of a society to become electricity producers, ranging from private households and communities to large utilities. Therefore, the legislation should be understandable to anyone without the assistance of legal expertise. At a later stage, the REFiT might have to become more complex, but by then stakeholders will have become experienced with this type of support scheme. A good example of this increase in complexity over time is the German REFiT scheme. While the first REFiT law from 1990 included only 5 articles, the number increased to 13 in 2000, 21 in 2004, and a staggering 66 articles in 2009. This was to account for issues connected to better market integration, grid connection, and tariff differentiation.

ELIGIBLE TECHNOLOGIES

As a first step, legislators will have to decide which renewable energy technologies they want to support, i.e. which technologies will be eligible for tariff payment under the REFiT scheme. In order to make this decision, there should be good knowledge about the potential and resource availability of each technology in a given region or country. National wind and solar maps (along with other resource maps) can be very useful for this purpose.

1 Mendonça, M., 2007; Roderick, P. et al, 2007; Sösemann, F., 2007; Grace, R. et al, 2008; Klein, A. et al, 2008; Fell, H.J., 2009b

Generally, it is recommended to support a whole basket of renewable energy technologies, instead of focusing on just one or two technologies which are currently the most cost-effective. This point should be repeated for emphasis: one of the key ways REFiTs lower costs later is by producing a diversified set of technologies now. In essence, a REFiT is a tool for technology development and cost reduction. It is one of the major advantages of REFiT schemes that the technology-specific approach allows for the development of a wide range of technologies at relatively low costs. If you are planning to have a large share of renewables in the future electricity mix, you will need a variety of different technologies. By supporting both fluctuating technologies, e.g. wind energy and solar, and technologies that are more constant, e.g. biomass, solar thermal, geothermal, and hydroelectric, you can lay the foundation for a 100% renewables-based electricity system at an early stage.

Nonetheless, some regions or countries opt for supporting only one technology with a REFiT. This is usually the case if additional support mechanisms are available for other technologies. A REFiT for only one technology such as photovoltaics (PV), however, includes certain risks mainly related to public acceptance if the cost of the policy is passed through to bill payers. As the electricity costs for PV are significantly higher than that of conventional energy and other renewable energy technologies[2], and the amount of electricity produced is comparatively small, the additional costs as distributed by financing mechanisms might seem rather high to consumers. In contrast, if a large portfolio of technologies is eligible under the REFiT legislation, the average cost for one unit of renewable electricity is rather low. To a certain extent, more mature technologies such as wind power will help less mature technologies such as PV to be developed. In this way public acceptance can be strengthened.

When defining the technologies eligible under the REFiT legislation, it is important to include precise definitions. This is especially true for biomass/waste and PV installations. The term "biomass" incorporates a large variety of resources, such as forestry products, animal waste, energy crops, and sometimes municipal wastes. Policy-makers have to decide upon the eligibility of impure biomass and waste material. Generally, the non-biodegradable fraction of waste is not eligible for tariff payment. In the case of PV, advanced REFiT schemes differentiate between certain categories, i.e. ground-mounted vs. building-integrated PV (BIPV).

ELIGIBLE PLANTS

Besides eligible technologies, those designing REFiTs will have to determine which plants are covered under the REFiT scheme. Usually, tariff payment only applies to generation plants in the given region or country. In this case of offshore wind turbines, the national territory can either be limited by the UN definition of Territorial Waters, i.e. 12 nautical miles offshore, or the Exclusive Economic Zone, i.e. 200 nautical miles offshore.

Moreover, the policy maker usually limits tariff payment to the size, i.e. the installed capacity of renewable energy plants. Especially in the case of hydropower, tariff payment can be granted only to plants up to a certain maximum capacity, e.g. 20 or 100MW. The reason for this is that large-scale hydropower is already slightly more competitive with conventional energy sources even without any financial support in areas with large resources. One unit of hydropower-based electricity can often be produced at costs as low as €0.02 or 0.03/kWh, whereas onshore wind and landfill gas electricity (the next cheapest sources) cost about €0.04-0.05/kWh. Besides, large-scale hydropower projects are more capital-intensive and have more significant environmental impacts than other renewables, meaning policy-makers may want to consider

2 The cost for PV systems has drastically reduced in recent years and is predicted to fall even further. This is at least partly a success of REFiT policies: through financing the initially expensive technologies they have increased demand and production, which led to a decline in overall cost.

excluding them from REFiT schemes. Large-scale hydropower projects also have negative environmental impacts, especially on down-stream areas, and cause social problems to the displacement of people living in the project area. Under certain conditions, the reservoirs can also emit significant amounts of greenhouse gases. Thus, large-scale hydro is often not considered a renewable energy source.

Some REFiT schemes also apply other limitations. The Spanish REFiT scheme, which stopped accepting new applications in January 2012, only grants tariff payment for installations with a maximum capacity of 50MW. These limitations often have historical reasons. In the past, it was believed that renewable energy could only cover a small share of the electricity mix and that, by definition, renewable energy power plants had to be small-scale and distributed. The recent experience in many countries, however, contradicts these assumptions. Even though the distributed application is still one of the major advantages of renewables, the development in wind energy shows that wind farms with several hundred megawatts of installed capacity are feasible and economically viable. Large-scale plants are also expected for other technologies, such as solar PV, Concentrated Solar Power (CSP), geothermal and biomass. Therefore, we suggest not including limits on plant size other than for large-scale hydropower. Instead, tariffs should be differentiated according to the size of each plant. Eventually, renewable energy capacity will have to replace large-scale conventional electricity plants, with no limits to be placed on either plant size or overall installed capacity.

The start of generation, i.e. the moment the installation gets connected to the grid, also determines whether a plant is going to be covered by the REFiT. We recommend only including newly installed capacity as old renewable power generation plants are likely to have profited from previous support instruments. Therefore, the coming into force of the legislation usually sets the starting point for eligible plants.

Theoretically, it is also possible to exclude certain producer groups from tariff payment. In the first German REFiT law of 1990, for instance, the legislator decided to exclude plants where publicly owned utilities owned a significant share. This can be an appropriate step where regulators plan to liberalise electricity markets and wish to allow new actors to become competitors to well-established national utilities. However, we recommend avoiding the exclusion of any producer group from tariff payment. The open, participatory and democratic nature of REFiTs is one of their most important characteristics. It also, by definition, ensures that renewable energy penetration is greater as more utilities are bound by the REFiT.

FINANCING MECHANISMS

A main feature of traditional REFiTs is that additional costs caused by the policy are distributed equally among all electricity consumers. This financial burden-sharing mechanism permits the support of large shares of renewable electricity with only a marginal increase of the final consumer's electricity bill. No government financing is included under these conditions. Moreover, by determining tariff payment and establishing the purchase obligation for all renewable energy by the existing utilities, the national government only acts as a regulator of private actors in the electricity market. Alternative financing mechanisms have proven to be sensitive towards external effects, such as changes in government or general economic downturns. However, in the context of developing countries with high levels of poverty, distributing the costs of a REFiT solely to consumers is likely to have serious negative consequences and would jeopardise efforts to increase energy access. Thus, innovative financing mechanisms - including co-funding from international climate change funds (Uganda), additional taxes on fossil fuels (Algeria) or subsidies for low-income households (Ghana) will be discussed in country case studies.

In order to pass the price from the producer of renewable electricity to consumers, the costs (the aggregated tariff payments) must be passed along the electricity supply chain. First, the producer of renewable electricity receives the tariff payment from the local grid operator. By legal obligation through the REFiT scheme, this grid operator is obliged to pay for, connect and transmit the produced electricity. Normally, renewable electricity producers get connected to the next distribution system operator (DSO). In some cases, however, a producer of a large plant might also decide to connect directly to higher voltage lines through the transmission system operator (TSO). Afterwards, the costs and the accounting data are passed to the next highest level in the electricity system until the national TSO aggregates all costs and divides it by the total amount of renewable electricity produced.

TARIFF CALCULATION METHODOLOGY

One of the most urgent questions for policy-makers dealing with REFiTs is how to get the tariff level right. A tariff that is too low will not spur any investment in the field of renewables while a tariff that is too high might cause unnecessary costs for consumers. We recommend developing a joint framework for all technologies eligible under the REFiT scheme in order to guarantee transparency and comparability.

Regulators (and the consultants and economists they frequently employ) have applied different methodologies for tariff calculations. Less successful tariff calculation methodologies are setting the tariffs based on the existing electricity price or 'avoided costs'. Another methodology bases the tariff on the actual cost of generation plus a small premium, thus offering sufficient returns on investment. Empirical evidence shows countries using the latter method have been most successful in increasing the rollout of renewable energy. This approach will hence be considered as 'best practice'.

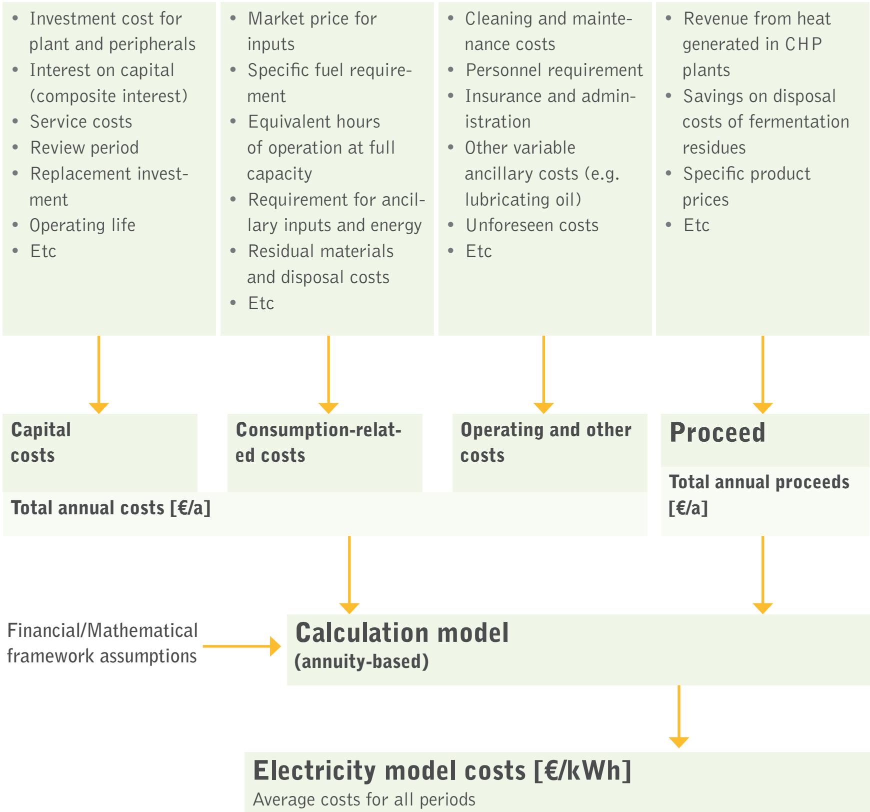
Different names have been used to describe this tariff calculation approach based on actual costs and profitability for producers. The German REFiT scheme is based on the notion of "cost-covering remuneration", the Spanish support mechanism speaks of a "reasonable rate of return", and the French "profitability index method" guarantees "fair and sufficient" profitability. Despite the variety in names and notions, in all cases the legislator sets the tariff level in order to allow for a certain internal rate of return, usually between a 5% and 10% return on investment per year. In some cases the rate will have to be higher as the profitability of renewable energy projects should be comparable with the expected profit from conventional electricity generation. Only if the profitability of renewable energy generation is similar to or higher than that of nuclear or fossil plants will there be an economic incentive to invest in cleaner forms of energy.

When determining the tariff for a new REFiT, an analysis of countries with similar resource conditions and existing REFiT policies might be useful first step. Therefore, we have included a lot of tables with data relating to real tariffs in the country case studies presented in this book. If, for instance, the neighbouring country has a well-functioning REFiT scheme, the tariff applied in this country might serve as a point of reference. Be warned, though, that the mere comparison of tariff levels will not be sufficient. Many other design options which will have an impact on the profitability of a project have to be taken into account, including the duration of tariff payment, grid connection costs and administrative procedures.

After a good frame of reference is established for tariffs, cost factors related to renewable electricity generation have to be evaluated. We recommend basing the calculations on the following criteria:

- Investment costs for each plant (including material and capital costs);
- Grid-related and administrative costs (including grid connection cost, costs for

Figure 2.1 German methodology and input variables for calculating electricity production costs
Source: BMU, 2008



the licensing procedure, etc);

- Operation and maintenance costs;
- Fuel costs (in the case of biomass and biogas); and
- Decommissioning costs (where applicable).

Based on this data, the nominal electricity production costs for each technology can be calculated. Tariff calculation methodologies are rather technical but certainly interesting for all committed policy-makers. As an example, we are going to present the German approach for tariff calculation for industrialized nations.[3]

Under the German REFiT scheme, a transparent tariff calculation methodology was developed based on the electricity generation costs. Generally, tariff payment is guaranteed for 20 years at the level applicable in the first year of production. However, the tariff applicable for new projects is revised every four years based on Progress Reports (see below).

3 3 The European Photovoltaic Technology Platform has developed a tool to calculate REFiTs for PV. The excel spreadsheet discloses all the key assumptions behind the tariff calculation model. www.eupvplatform.org/pv-development/tools.html and.

For the setting of the tariff, both the Ministry for the Economy and the Ministry for Environment (BMU) commission studies by various independent research institutes. In addition, wide-ranging surveys on costs are conducted among producers of renewable electricity. The results are cross-checked with published cost data and empirical values from project partners of the ministries. In this way, the average generation cost of plants is evaluated. To finally determine the tariff level[4], several parameters are compiled, including output data of average plants currently in operation, the purchasing costs for fuel in the case of biomass and biogas, investment cost (machinery, construction, grid-connection, etc), and operation cost (see figure 2.1).

Germany applies this 'annuity method' to calculate the electricity generation costs for all renewable energy technologies except wind energy. This method of dynamic investment calculation allows for translating one-off payments and periodic payments of varying amounts into constant, annual payments[5]. For wind power, the net present value method is applied in order to take the large variation in payment over the 20-year period into account. This variation is mostly due to a higher tariff payment in the first years of operation. All costs for renewable electricity generation are calculated on a real basis, adjusting them to inflation based on a specific reference year. Even though the German REFiT is not explicitly inflation indexed, the effects are counterbalanced by the calculation method.

TECHNOLOGY-SPECIFIC TARIFFS

If the policy maker calculates the tariffs based on the generation cost of renewable electricity, technology-specific tariffs are the natural result. Technology-specific support is one of the main features of many REFiTs. In contrast to other quantity-based support schemes, such as tradable certificates, REFiTs try to take the technology-specific generation costs into account in order to promote a broad base of different technologies. Technology-specific support is necessary because of the large differences in generation costs among renewable energy technologies. While certain types of biomass or biogas can already be produced for less than €0.03/kWh, less mature technologies are produced at much higher cost. However, from 2007-12 the costs for photovoltaics have more than halved from €0.43/kWh to € 0.19/kWh – not least because of the positive impact of REFiTs.[6]

Further differentiation might be necessary within the generic group of biomass products. As mentioned above, biomass fuel types include forestry products, animal waste, energy crops, and sometimes waste or the biodegradable fraction of waste. Generation costs vary widely as, for instance, energy crops are generally more expensive than residues from forestry, and producing biogas from animal residues is more expensive than the generation of landfill or sewage gas. Therefore, some REFiT schemes take different fuel types for biomass plants into account. In addition, the cost for different transformation processes of biomass to electricity, such as co-combustion and gasification, might have to be reflected in the tariff design.

SIZE-SPECIFIC TARIFFS

Besides technology-specific tariffs, many REFiT schemes include different remuneration levels for different sizes of a given technology. The underlying idea is that larger plants are generally less expensive. Therefore, most REFiT schemes set specific tariffs for a particular technology in relation to plant size. The easiest way is to establish different groups according to the installed capacity.

The choice for the range of each group does

4 4 The German REFiT scheme has the rank of a law. Therefore, the initial proposal of the Ministry has to pass through the government and parliament and might therefore changed during the consecutive political decision-making process.

5 BMU, 2008

6 compare Ragwitz, M. et al, 2007 and BNEF, 2012

not necessarily have to be random. Many technologies offer standard products of a certain size range. In the case of PV, for instance, a typical rooftop installation for private households has a capacity of 3-30kW. Larger-scale rooftop installations for industrial buildings or farms usually have an installed capacity of up to 100kW. Therefore, an analysis of standard products of a certain technology in a given region or country will help to set plant-size-specific tariffs. In order to avoid potential disruptive effects through size categories, the legislator also has the option to develop a formula which relates the plant size to the tariff payment.

DURATION OF TARIFF PAYMENT

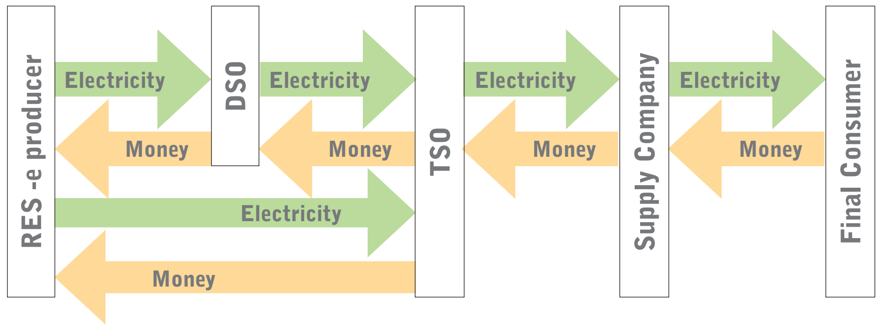
The duration of the tariff payment is closely related to the level of tariff payment. If a legislator desires a rather short period of guaranteed tariff payment, the tariff level has to be higher in order to assure the amortization of costs. If tariff payment is granted for a longer period, the level of remuneration can be reduced. However, in the case of longer payments inflation will be greater and must be factored in. REFiTs around the world usually guarantee tariff payment for a period of 10-20 years, while a period of 15-20 years is the most common and successful approach. A payment of 20 years equals the average lifetime of many renewable energy plants. Longer remuneration periods are normally avoided because otherwise technological innovation might be hampered. Once tariff payment ends, the producer will have a stronger incentive to reinvest in new and more efficient technologies instead of running the old plant in order to receive tariff payment. However, producers normally have the right to continue selling electricity under standard market conditions.

When fixing the duration of tariff payment, policy-makers should clearly state whether producers have the right to leave the REFiT scheme during the guaranteed payment period. This might be of interest for renewable electricity producers if the spot market power price for 'grey' electricity, i.e. fossil or nuclear power, rises above the guaranteed REFiT as selling electricity on the open market could be more profitable. In countries which have started to incorporate the negative external costs of fossil fuels and remove subsidies for conventionally produced electricity, this will probably start to occur more in coming years, especially for the most cost-effective renewable energy technologies such as wind energy and landfill gas capture. In this case, legislators basically have three options:

1. They can mandate that the REFiT duration period has to be 'fulfilled' and the renewable electricity producer does not have the right to enter the 'grey' power market. The positive effects of this approach are the lower electricity costs for final consumers, once the power price for conventional power exceeds the guaranteed tariff level. In this case, the REFiT will stabilize and lower the average electricity price. However, such a policy could delay the integration of green electricity into the grey power market as developers will be getting less for their renewable electricity.
2. Regulators can state that the renewable electricity producer has the right to leave the REFiT but no right to re-enter the REFiT scheme. This would in essence complicate the participation of renewable electricity producers in the conventional grey market as future prices might be difficult to anticipate.

The legislation can give the producer the opportunity to switch between the guaranteed remuneration under the REFiT and the participation within the spot market for electricity. By those means, the producer can gather first-hand experience in the power market without being exposed to all risks related to volatile market prices. In this case, regulators would determine a time period in which the producer is allowed to change between both systems, such as once every month or once every year.

Figure 2.2 General flow of electricity and financing under REFiT schemes
Note: RES-e = electricity from renewable energy sources.
Source: Jacobs, 2009



PURCHASE OBLIGATIONS

Besides long-term tariff payments, the purchase obligation is the second most important 'ingredient' for all REFiT schemes as it assures investment security.

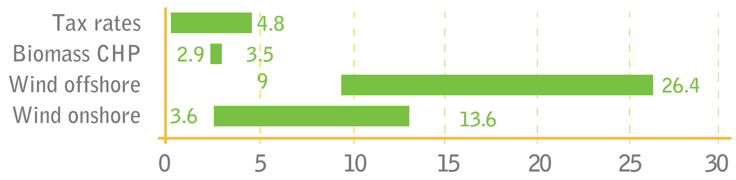
It obliges the nearest grid operator to purchase and distribute all electricity produced by renewable energy sources, independent of power demand. This means, for instance, that in times of low demand, the grid operator will reduce the amount of 'grey' electricity while all 'green' electricity is incorporated into the electricity mix. The purchase obligation is especially important for more variable renewable energy technologies, such as wind and solar PV, as the producer cannot control when the electricity will be generated. In contrast, gas and coal and nuclear power plants can increase and reduce output, as can hydroelectric dams, biomass facilities and geothermal power stations. Therefore, advanced REFiT schemes sometimes include tariff differentiation according to electricity demand (Demand-Oriented Tariff Differentiation). The purchase obligation protects renewable electricity producers in monopolistic or oligopolistic markets where the grid operator might also dispatch power generation capacity. When decisions are made about which power generation sources to use to meet electricity demand, such grid operators might be biased and dispatch power from their own power plants first. As an example of a well-designed purchase obligation, the German REFiT establishes an obligation to purchase, transmit and distribute all electricity produced under the REFiT scheme.

PRIORITY GRID ACCESS

Unfair grid access rules are often a barrier in power markets where the grid operator itself is engaged in power production. This lack of 'unbundling' generation, transmission and distribution might lead to a situation where the grid operator prioritizes its own generation units when it comes to the question of which power plant will get connected to the grid. Therefore, REFiTs usually include provisions that eligible plants must be connected to the grid. The German REFiT scheme, for instance, states that 'grid system operators shall immediately and as a priority connect plants generating electricity from renewable energy sources'. We recommend this approach as the 'immediate' connection prevents delays by the grid operator and 'priority' connection enables renewable energy plants to get connected to the grid before conventional power generation units.

Equally, the lack of transmission capacity can seriously offset the deployment of renewables. This is especially true in many African

Figure 2.3 Percentage of grid integration costs compared to total investments
Source: GreenNet-Europe, undated



countries. However, existing bottlenecks in the grid should not be an excuse to restrict access for green electricity producers, but rather be an incentive to undertake much needed grid reinforcement in line with national grid extension plans and expected growth in overall grid capacity.

COST-SHARING METHODOLOGY FOR GRID CONNECTION

Grid connection rules have an impact on the overall profitability, and therefore success, of renewable energy support policies. Even though other support mechanisms may be well established in a given country, discriminatory practices, regulations, interconnection standards and other rules might offset or seriously disturb the deployment of renewable energy projects. This is due in particular to the high cost for grid connection in relation to the total project costs. The European study GreenNet-Europe has calculated that, in the case of offshore wind power plants, grid connection can account for up to 26.4% of total investment costs.

Even though the share is lower for all other renewable energy technologies, the methodology for cost sharing of grid connection is often essential when it comes to the decision as to whether a project is profitable or not (See Figure 2.3). Many REFiTs define the methodology used for dividing the costs for grid connection between the renewable electricity producer and the grid operator. Some legislators prefer to establish these rules in legislation for grid regulation.

Essentially, three different methodologies can be applied to connection charging: the 'deep', the 'shallow' and the 'super-shallow' (Knight et al, 2005). The deep connection charging approach leaves the producer of renewable electricity with all costs, both for grid connection and for grid reinforcement. This includes the costs for the connection line to the next connection point and the costs for reinforcing the already established grid infrastructure. In the case of a lack of transmission capacity, the producer has to pay for the necessary upgrading. We do not recommend this approach. Historically, it was employed for large-scale conventional power plants. In the light of the high investments costs for these power plants, the additional expenditures for grid connection under the deep approach were negligible. This is different for renewable energy projects, which tend to have much lower overall costs per project than mammoth nuclear and coal-fired units. Furthermore, the deep approach provides an incentive to produce electricity only in areas with a well-developed power grid.

This makes sense in the case of coal and gas-fired power plants but not in the case renewable energy projects. Wind power plants, for instance, should be built in the windiest locations and not just in regions with available grid capacity.

As an alternative, the shallow connection charging approach was developed. It states that the renewable energy producer only has to pay for the new electricity line to the next grid connection point, while the grid operator has to cover all costs for potential reinforcement of the existing grid infrastructure. The costs covered by the grid operator will be passed on to the final consumer in terms of system charges. Under this approach, the renewable electricity producer will choose the location for the power plant depending on the resource availability (wind speed, etc.) and not infrastructure availability.

It is also possible to mix both approaches. In this case, the power producer pays for the electricity line to the next connection point. The costs for grid reinforcement are shared between the grid operator and the electricity producer. Normally, the share covered by the producer depends upon the assessment of their proportional use of new infrastructure. This combination can be seen as a compromise between an incentive for using available grid infrastructure and choosing the resource optimal locations.

A super-shallow connection charging approach was implemented in some European countries to promote the deployment of offshore wind power plants, particularly in Denmark and Germany. Connection lines from offshore wind fields to the nearest onshore connection point are rather expensive because of the long distances involved. To free the offshore wind power developers from this financial burden, legislators decided that even the costs for the new connection line from the offshore wind park to the next onshore connection point have to be paid by the grid operator.

We recommend using the shallow grid connection approach or even the super-shallow grid connection approach. This allows for a strict separation of infrastructure investment and investment into new generation capacity. There is clearly a tendency for countries wanting to promote renewables to move away from the deep to the shallow connection charging approach. Whatever cost-sharing methodology regulators wish to apply, they must take the financial advantages (super-shallow approach) or disadvantages (deep connection charging approach) of green electricity producers into account when calculating the tariffs.

The estimated costs for grid connection and reinforcement must be part of the tariff calculation methodology.

EFFECTIVE ADMINISTRATIVE PROCEDURES

The experience of some REFiT countries shows that, despite good economic and grid access conditions, generation capacity for renewable electricity does not increase significantly. The reasons for mediocre performance despite having the best designed REFiT can include administrative barriers such as long lead times for project approval, a high number of involved authorities and the lack of inclusion into spatial planning.[7] The European Commission, for example, recommends implementing quicker approval procedures for small-scale projects because they differ fundamentally from large-scale coal-fired power plants. It makes little sense to force both types of projects to go through the same administrative process.[8]

Minimizing lead times

One major administrative barrier for renewable energy projects is long lead times. In the EU, lead-times for small-scale hydropower development vary from 12 months (Austria) up to 12 years (Portugal and Spain). Policy-makers can reduce this barrier by establishing a time limit on the entire approval process. National and local entities will be forced to deal with project permissions in due time, and organizations opposed to renewables will have less influence when it comes to non-economic barriers. Setting deadlines for the decisions of each authority will help, as long as authorities can keep them. Especially on a local level, administrative bodies often lack experience in dealing with industrial size projects.

7 Ragwitz, M. et al, 2007; Roderick, P. et al, 2007; Coenraads, R. et al, 2008

8 EU Commission, 2005

Minimizing and coordinating the authorities involved

Another important constraint for the development of renewables is the large number of authorities involved in the licensing process. In France, for instance, wind power producers have to get in contact with 27 different authorities at different political levels. In some Italian regions, up to 58 permits from different authorities are needed for small-scale hydropower plants.

Complexity can be reduced by clarifying the responsibilities of each authority, and establishing a new organization dedicated to rapid renewable energy deployment, sometimes called a 'one-stop shop', to coordinate and simply the planning process. Most successful are those countries that authorize one single administrative body to deal with all subordinated authorities at different political levels.

Inclusion in spatial planning

Spatial planning provisions help to organize the use of physical space in a given country, such as stipulating where roads, industrial areas, power plants, and sewer systems should be located. Spatial planning at local level must anticipate future renewable energy projects by including them when drafting or revising regulations and standards. In this process the available resources, such as wind speed and solar radiation, should be identified. The German building code of 1996, for instance, obliged each community to designate specific areas for the development of wind power projects. By those means, the legislator managed to shorten the administrative process considerably.

SETTING TARGETS

Sometimes REFiT legislation is combined with ambitious political targets for renewables. This has merit, as targets are important in signalling long-term commitment to investors. They indicate that support mechanisms will be in place for a certain period of time and they increase the likelihood of tariffs being sufficiently high. Targets should always be formulated as minimums by including the words 'at least' (e.g. 'at least 20% by 2020'). This way, targets do not have the negative effects of acting as capacity caps, where the deployment of new installation slows or comes to a halt once the target has been reached. '

Targets can be formulated as a certain share of renewables in the overall energy or electricity mix. This has been done by the German legislator who determined that the German REFiT scheme 'aims to increase the share of renewable sources in electricity supply to at least 30% by the year 2020 and to continuously increase that share thereafter'. Alternatively, targets can also be established for the installed capacity. We recommend establishing targets for the short, mid and long term, thus establishing a pathway of how renewables can increasingly substitute fossil and nuclear power generation sources.

PROGRESS REPORTS

Last, but not least, evaluating and periodically reporting on the state and progress of REFiT programmes is crucial for long-term success. Reporting and evaluation is usually the task of the ministry that handles the policy. It ensures that the law works well and, if necessary, recommends how it could be improved or amended. In some countries, progress reports provide the scientific grounds for periodic amendments of REFiT schemes. This periodic revision guarantees stability for the producers, who know that the legislation will not be changed in the meantime, but it also gives politicians room for modifications. When regulators implement a REFiT scheme for the first time, frequent adjustments might be necessary in the first couple of years. Progress reports typically include an analysis of the growth rates and the average generation costs of all eligible technologies. They identify the economic, social and environmental costs and benefits of renewable energy support (especially an estimate of greenhouse gas reductions). They review the additional costs for the final consumer. And they calculate the ecological effects of renewable energy plants, positive and negative, on nature and landscape.

CHECKLIST FOR A BASIC REFIT SCHEME

To summarize this chapter, we have developed the following checklist that regulators (and anyone with an interest) can refer to when drafting a basic REFiT scheme. A web-based tool taking these dimensions into account is also available to help develop draft REFiT policies.[9]

- Choose the eligible technologies based on the resource availability in your country.
- Determine which kind of power production plants shall be eligible.
- Establish a transparent tariff calculation methodology based on the generation costs of each technology.
- Set technology- and size-specific REFiTs.
- Fix the duration of tariff payment (usually 20 years).
- Create a robust financing mechanism, sharing the additional costs among all electricity consumers.
- Oblige the grid operator to purchase all renewable electricity.
- Grant priority grid access.
- Regulate the cost sharing for grid connection and reinforcement based on the 'shallow' or 'super-shallow' connection charging approach.
- Create effective administrative procedures.
- Set renewable energy targets and mention them explicitly in the REFiT legislation.
- Establish a progress report as the scientific the basis for future adjustments.

9 http://www.futurepolicy.org/renewableenergy.html

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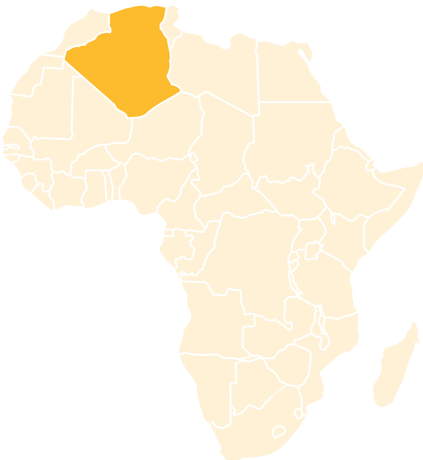
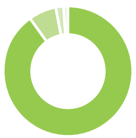
CHAPTER

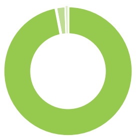
III

PIONEERS OF REFiT POLICIES

Algeria







Energy Mix

Source: International Renewable Energy Agency, 2012

- **Natural Gas** = 58%
- **Oil & Oil products** = 40%
- **Coal and Coal Products** = 1%
- **Hydro** = 0.1%
- **Biomass** = 0.04%

Electricity Generation Mix

Power plant installed capacity 10,410 MW

- **Thermal (gas & oil) 10,100 MW**
- **Large hydro 280 MW**
- **Concentrated Solar Power 20 MW**
- **Wind 10 MW**

Total 10,410 MW

Electricity Stats

Electricity consumption per capita = 971 kWh

Electrification Rate

National = 99.3%

BACKGROUND & POLICY DRIVERS

Algeria was the first country in Africa to adopt a renewable energy Feed-in Tariff in 2004. However, the oil and gas rich country still heavily depends on thermal generation. Algeria is currently the largest oil producer in the Mediterranean region with more than 1.8 mb/d produced in 2010, about 36% of the total regional output.

Unlike most other African countries, near universal electrification means increasing access is not an issue. Thus, the motivation for the introduction of a REFiT is slightly different. Algeria's national energy policy expresses the country's priorities in three principles: provide domestic consumers with sufficient and uninterrupted electricity, preserve energy resources to ensure the country's energy independence and promote exports in order to provide resources for Algeria's development. The three goals provide the basis for the "model of national energy consumption", adopted by the Council of Ministers on 20 June 1984. The model, among others, puts an emphasis on the use of natural gas and liquefied natural gas – currently plentiful in Algeria – but also points to a progressive reduction of the share of hydrocarbons in the national energy mix and to the promotion and development of renewables.[1]

Algeria adopted a renewable energy and energy efficiency development plan in February 2011, aiming at 40% of electricity production from renewables by 2030. The country wants to add 12,000 MW of new installed capacity mostly from solar generation. In addition, if Europe can guarantee demand and provide attractive concessional funding, Algeria will consider building a further 10,000 MW of renewables all dedicated for export.

A key driver behind the promotion of renewable energy is the need for diversification of supply. Oil and gas reserves eventually will expire – a major concern not only in Algeria. There may not be sufficient resources for local needs available as early as 2030. In respect of long-term export commitments and rising fossil fuel prices, more diversification is urgently required. Other drivers supporting renewable energy and the establishment of a Feed-in-Tariff include the government's desire to avoid the development path taken with the hydrocarbon industry, where technology was imported and many of the benefits exported. Instead, the renewable energy sector is intended to help meet local demand, develop indigenous research capacity, promote local manufacturing and industry, and create jobs. A 2009 finance law stipulates that foreign investors can only hold up to 49% shareholding in an Algerian company; it increases bureaucratic hurdles for the approval of power sector activities with foreign ownership. And while repatriation of profits is allowed, foreign companies are encouraged to reinvest in Algeria.[2]

In 2002, Algeria started a process of liberalization and "unbundling" of the country's energy sector,[3] which is still in progress. Privatization of power generation is permitted but electricity transmission, possibly distribution and all gas transport functions remain state-controlled. Algeria has already seen the emergence of private projects, such as the 2005 Kahrama gas plant (80% owned by a US company) and the construction of a concentrated solar power (CSP) / natural gas hybrid plant at Hassi R'mel by an Algerian-Spanish consortium.[4] Yet, Sonelgaz, the National Society for Electricity and Gas, still dominates the sector, exemplifying a state-driven approach with limited participation of private or civil society organizations.

Algeria's renewable energy law was enacted in August 2004[5], establishing a national framework for the promotion of renewable energy.[6] The 2004 renewable energy act was planned to help implement the 1984 energy strategy through the promulgation of four

1 Supersberger, N. et al., 2010: p. 31.

2 Supersberger, N. et al., 2010: p. 42.

3 Democratic and Popular Republic of Algeria, 2002.

4 Supersberger, N. et al., 2010: p. 35.

5 Democratic and Popular Republic of Algeria, 2004.

6 A "cost diversification" law that is in effect a Feed-in-Tariff policy had been adopted earlier in March 2004.

Table 1. Algeria REFiT Design Features

FIT Design Features	Algeria
Integration with Policy Targets	• Goal to produce 40% of energy and 20% of electricity from renewables by 2030 • 2011-2030: an additional 12,000 MW from renewable energy
Eligibility	Gas with steam/hot water cogeneration Solar thermal/gas hybrid Waste-to-energy Hydropower Wind power Concentrated Solar Power / solar PV Power plant size cap: ≦ 50 MW
Tariff Differentiation	(see below)

Tariff Differentiation	• Technology	• Premium Tariff	• Hybrid technology	• Premium Tariff
			Share of solar component of a solar thermal/gas hybrid power plant	
	Waste-to-energy			
	Hydropower	200%	> 25%	200%
	Wind power	100%	20 <25%	180%
	Concentrated Solar	300%	15 < 20%	160%
	Power / Solar PV	300%	10 < 15%	140%
	Gas with steam/hot	160%	5 < 10%	100%
	water cogeneration		Portion of useable	
	Solar thermal/gas	200%	energy recovered from	
	hybrid		gas electricity generation in the form of steam and/or hot water:	
			≦ 20%	160%
			< 20%	135%
			15 – 19%	120%
			10 – 15%	80%

Payment Based On	Premium per kWh above a base tariff that may be intended to be the annual average price of electricity, but to date this has not been explicitly determined
Payment Duration	Not stated. Presumably negotiable or based on the project lifetime
Payment Structure	Annual payment based on an annual production quota set per project per year
Cost Recovery	To be covered by the government. A National Renewable Energy and Cogeneration Fund (1% fee on petroleum royalties and other contributions) is one mechanism for this.
Interconnection Guarantee	Interconnection is guaranteed if interconnection facilities meet the standard of utility
Interconnection Costs	Paid by the generator. Where the grid operator makes the investment on behalf of the generator, these costs may be recovered from tariff payments
Purchase and Dispatch Requirements	Guaranteed purchase up to the annual production quota
Amount Purchased	100% of electricity outputPriority dispatch
Purchasing Entity	Government-owned single buyer (Sonelgaz)
Commodities Purchased	Electricity only
Triggers & Adjustments	Renewable energy production quota to be set per project per year. No adjustment for inflation, unless this is covered in the base tariff
Contract Issues	Negotiated on case-by-case basis
Payment Currency	Not stated.

entities with the remit to promote renewable energy.[7] In addition, a special renewable energy fund was established in 2010 and upgraded by an executive decree to a National Renewable Energy and Cogeneration Fund one year later.[8] Financed by a one per cent fee on petroleum royalties and other contributions, this mechanism under the responsibility of the Ministry of Energy and Mines will be used to recover the cost of the REFiT policy, as well as help co-finance national renewable energy and cogeneration projects.

The 2004 Electricity Cost Diversification Law[9] obliges the system operator to connect renewable energy power plants, guarantee the purchase of power and pay a technology-specific premium per kWh of electricity produced.[10]However, a renewable energy production quota is to be set per project and year. Power plants of up to 50 MW are eligible across all technology types. A minimum plant size is not set. The generator pays for the interconnection study while the system operator pays for connection costs,[11] with the caveat that the latter must be economically acceptable.

7 The National Observatory for the Promotion of Renewable Energies under the Ministry of Environment (awareness raising),7 the Centre for the Development of Renewable Energies (research & development, pilot projects), the Algerian Institute for Renewable Energy and Energy Efficiency (standards and regulatory instruments) and New Energy Algeria (electricity generation)

8 Democratic and Popular Republic of Algeria, 2009 and 2011.

9 Democratic and Popular Republic of Algeria, 2004.

10 For solar thermal/natural gas hybrid power plants and for thermal power plants that recover a portion of the waste heat from electricity production in the form of steam and/or hot water (known as "co-generation") the premium tariff is adjusted pro rata according to the per cent of hybridization/waste heat recovered.

11 MENA-OECD Energy Task Force, 2011.

KEY AND UNIQUE FEATURES

Concentrated Solar Power

Unlike many countries in Africa implementing or considering a REFiT, the Algerian model includes a tariff for Concentrated Solar Power (CSP) in addition to solar PV, providing an indication of the importance placed on this technology type by the country. Solar is by far the renewable energy type with the highest potential in the country, followed by wind. Biomass, hydro and geothermal resources are either minimal, already exploited or not well known.

Contract term

Unlike most other Feed-in-Tariff policies, the Algerian REFiT law makes no reference to a contract term between a generator and the government-owned buyer (Sonelgaz). Presumably this is negotiable or follows precedents established by existing (thermal and wind) IPPs in Algeria.

External factors

The price of electricity in Algeria is among the lowest in the world,[12] and below the real cost of generation[13] due to the significant subsidies available for conventional energy sources that reduce the price for all consumers.[14] Given that the tariffs paid are expressed as an arbitrary percentage of this subsidized price, rather than calculated on the real cost of generation, even a REFiT tariff of 300% the average electricity price may not be sufficient to make renewables competitive. However, the measures Algeria has introduced to encourage local economic development and control increase the likelihood that domestic

12 Fujiwara, N., Alessi, M., Georgiev, A., 2012: p. 8.

13 Sonelgaz, undated.

14 Fujiwara, N., Alessi, M., Georgiev, A., 2012: p. 8.

project developers and investors will be taking part in the REFiT.

IMPACTS

Even though a legal framework is in place, not a single project has become operational under the REFiT law to date. Renewable energy power plants have so far been financed or subsidised by Algerian public funds or international development partners. While Sonelgaz's 2010 annual report notes that its wind farm tariff was commercially viable, it remains unclear why a 10 MW wind farm built by a French/Algerian consortium was developed outside of the REFiT.

Although the Algerian REFiT tariff reaches as much as 300% of the average electricity price, the average rate is either not determined[15] or is so low that the scheme is not effective.[16] The average electricity price and thus the tariff may fluctuate from year to year and there is no guaranteed "floor" price, meaning investors and project developers may not be provided with the certainty they require.

OUTLOOK

Faced with growing domestic demand for gas and electricity on the one hand and the need to maintain gas exports as a key contributor to the economy on the other, the Algerian government recognizes the importance of diversifying its energy supply. The country clearly has an interest in stimulating renewable energy investment, infrastructure and skill building in Algeria, particularly through local companies. The announcement of a plan by Sonelgaz in 2010 to build a local factory for solar PV modules with an annual production capacity of 120 MW by 2013 is a good example.[17]

However, given Algeria's focus on state-led projects under the national development strategy[18], the REFiT is unlikely to contribute much to the country's ambitious renewable energy plans. It may be seen as a mechanism to support a selected number of projects under the national strategy but more likely is intended for projects that fall outside of the plan and hence are of lower priority. The authorities are aware of the lack of projects under the REFiT and are apparently redesigning the renewable energy law. Some parts of the government appear to be looking for close partnerships with the European Union for the export of green energy, with both public and private sector participation, but so far there are no indications of how this would affect the plans for a revised REFiT policy.

15 Supersberger, N. et al., 2010: p. 37.

16 Fujiwara, N., Alessi, M., Georgiev, A., 2012: p. 8.

17 Sonelgaz, 2010: p. 54.

18 Ministry of Energy and Mines, 2011: p.18.

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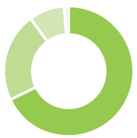
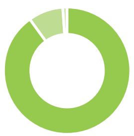
Kenya



Energy Mix

Source: Energypedia, 2012

- **Biomass / Wood fuel / Charcoal** = 68%
- **Petrol / Diesel** = 22%
- **Electricity** = 9%
- **Others** = 1%



Electricity Generation Mix

Power plant installed capacity 1,515MW

- **Hydro 3804.8 GWh** = 52.1%
- **Thermal 2373.4GWh** = 32.5%
- **Geothermal 963.9GWh** = 13.2%
- **Bagasse co-generation 131.4GWh** = 1.8%
- **Wind 29.2 GWh** = 0.4%

Electricity Stats

Electricity consumption per capita = 143 kWh

Electrification Rate

Urban = 51% **Rural** = 4%

BACKGROUND AND POLICY DRIVERS

Kenya has made tangible progress in increasing access to electricity for its population in recent years. The overall electrification rate more than doubled in a span of just eight years, reaching almost 30% in 2011. However, the majority of new connections occurred in urban areas and rural areas remain largely unconnected (4%), with two thirds of the population still relying primarily on biomass and wood fuel. As concerns production of electricity, the existing capacity is barely able to keep up with demand.[1] Given that more than 50% of Kenya's electricity comes from hydropower, the situation is particularly difficult during the summer months when water levels are low. Capacity gaps are then compensated by expensive thermal generation based on fossil fuels.

Kenya's REFiT was first implemented in 2008 by the Ministry of Energy (MoE) after a four-year process. The World Bank was keen to identify ways to promote renewable energy, and following initial pre-feasibility and feasibility studies in 2004, small hydro, wind and biomass were all identified as promising new resources.[2] The MoE, the Energy Regulatory Commission (ERC), state utility Kenya Power (KPLC) and the government-owned Kenya Electricity Generation Company Limited (KenGen)[3] were all involved in the development of the policy. According to an associate of KPLC, there were three main reasons to implement a REFiT in Kenya: first, to promote the uptake of renewables and increase the power production in general; second, to promote smaller electricity projects. Finally, the authorities wanted to open up the energy market and shift more power generation to the private sector. The Kenyan government used to favour state-led investments in large-scale projects, foremost implemented by KenGen.

While investors initially welcomed the REFiT policy, it was soon criticised as favouring state institutions. The financial models of the first draft of the REFiT were based on projects involving government institutions and thus excluded the investment costs typically born by the private sector. In particular, investors pointed out that the resulting tariffs did not take into account higher interest rates and overall higher capital costs applicable to the private sector. In addition, developers criticised the limitations placed on eligible technologies and demanded that the policy should include technologies other than wind, biomass and small hydro.

In response to the concerns, the policy was reviewed by the "FiT steering committee", which included relevant public and private sector stakeholders but excluded civil society.[4] The second draft, published in 2010, added biogas, geothermal, and solar PV as eligible technologies. Furthermore, the tariffs for wind and biomass were adjusted upwards.[5] Project developers interviewed for this book said that while tariffs for hydropower projects were reasonable, the wind tariff would be viable only on sites with constant high wind speeds and the solar tariffs were too low to attract financing.

KEY AND UNIQUE FEATURES

Negotiated tariffs

Kenya's tariffs are not fixed but negotiated for each project. KPLC negotiates according to the actual costs for the project development and the rate of return for investors. In some cases, negotiations have continued for over two years.

The REFiT distinguishes between firm and non-firm tariffs. In this case "firm" means a fixed amount of generation (must-generate) has been agreed on upfront between the IPP and the utility. Allowing for more planning

1 ECA, Ramboll, 2012.

2 Geothermal resources were not included in the study as they were already being exploited as of 1981

3 KenGen is not an IPP because it is mostly owned by the government, but operates similarly to a private company. However, it can access government money and lower interest rate loans.

4 Kenya has a vibrant civil society engaged in climate and energy issues, who have formed the Kenya Climate Change Working Group, see http://www.kccwg.org/

5 Ministry of Energy, 2011: pp. 7-11.

Table 1. Kenya REFiT Design Features

FIT Design Features	Kenya			
Integration with Policy Targets	As per the Long Term Energy Strategy 2012-2030: • 5,530 MW from Geothermal Energy • 1,000 MW from Biomass Energy • 2,000 MW from Wind Energy • 300 MW from small Hydro Energy			
Eligibility	Biogas (0.5 – 40MW) Biomass (0.5 – 100MW) Geothermal (< 70MW) Small hydro (0.5 – 10MW) PV (0.5 – 10MW) Wind (0.5 – 100MW)			
Tariff Differentiation	• Technology	• Firm	• Non-Firm	• Normal
	Biogas	0.08 US$	0.06 US$	
	Biomass	0.08 US$	0.06 US$	
	Geothermal			0.08 US$
	Small Hydro			
	• 0.5 < 1MW	0.12 US$	0.10 US$	
	• 1 – 5MW	0.10 US$	0.08 US$	
	• 5 – 10MW	0.08 US$	0.06 US$	
	PV	0.20 US$	0.10 US$	
	Wind			0.12 US$
Payment Based On	Generation cost plus return on investment (12% post tax on equity)			
Payment Duration	20 years			
Payment Structure	Fixed Ceiling			
Cost Recovery	Pass-through to consumers. 85% for PV and 70% for the other technologies eligible			
Interconnection Guarantee	Interconnection is guaranteed if interconnection facilities meet the standard of utility			
Interconnection Costs	Paid by the generator. Where the grid operator makes the investment on behalf of the generator, these costs may be recovered from tariff payments			
Purchase and Dispatch Requirements	Guaranteed purchase if technical requirements are met; Priority dispatch			
Amount Purchased	Guaranteed purchase if technical requirements are met; Priority dispatch			
Purchasing Entity	Government-controlled network operator KPLC			
Commodities Purchased	Electricity only			
Triggers & Adjustments	FiT policy is revised every three years			
Contract Issues	Negotiated on a case-by-case basis			
Payment Currency	FiT denominated in US$, payment offered in USD, EUR or KES			

certainty for the utility and a higher tariff for the IPP, the firm tariff has thus been favoured in the past. A "non-firm" tariff has no prior fixed must-generate clause in the PPA. For geothermal and wind there is no differentiation between firm and non-firm tariffs. Regardless of technology, all tariffs are limited by one common maximum tariff ceiling, which cannot be exceeded.

Grid connection

The policy only allows for power plants connected to the main grid. The costs for the interconnection are borne by the IPP, who will try to recover them through negotiating a higher tariff, extending the consultation process yet further. As an exception, solar PV systems are eligible for isolated mini-grids as, according to KPLC, remote arid or semi-arid areas are most suitable for PV powered mini-grids.

EXTERNAL FACTORS

Access to finance

According to KPLC, few projects proceed beyond the feasibility study. The most common barrier cited in interviews was securing project financing, particularly at interest rates suitable for the relatively low REFiT tariffs for technologies other than hydro. This is particularly true for SMEs and community projects, for which accessible loans are too small for the 500kW minimum project size under the REFiT.

Expertise and technical capacity

Lack of local expertise and technical capacity is a problem in Kenya, and increases the risk for investors, making lending less likely. Local developers struggle to carry out feasibility studies that are in accordance with KPLC's standards. However, local 'learning by doing' is taking place. For example, the first small hydro project successfully installed under the REFiT by the Kenya Tea Development Association (KTDA) helped local engineers to build up valuable expertise.

Contractual red tape

Negotiating a PPA is a lengthy process and only a few lawyers in Kenya are qualified for this. KTDA highlighted the related costs as problematic especially for communities. Navigating the vast variety of government bodies to purchase concessions or licenses create additional barriers for the implementation of new projects.

National grid

Connecting new power plants to the national grid is very expensive, which can deter many potential small-scale generators. Many stakeholders have also pointed out the need to upgrade the existing grid to be able to both absorb the additional production capacity and maintain stability in light of the growing number of variable energy sources, such as wind power, in the grid.

Land tenure

Several stakeholders have identified insecure land tenure as an important issue. Accessing land for projects can be difficult and subject to underhand dealings. This could potentially bring renewable energy projects into conflict with local communities who depend on the land for their livelihoods but may not have legal tenure.

Cost to consumer

Unlike its neighbours, Kenya does not subsidise electricity. While this has led to a functioning and trust-worthy utility, it also means that additional costs of the REFiT are largely passed on to all consumers. At least in the short and medium term, this will lead to higher electricity prices for consumers and may thus limit accessibility for low-income households.

IMPACTS

So far, only two projects are operating under the REFiT: a 920kW small hydro plant owned by the KTDA and a 5MW geothermal wellhead generator operated by KenGen. However, following the 2010 revision of the policy tariffs are now attractive for small-scale hydro, biomass and wind power projects and there are currently around 60 approved projects in the pipeline. Due to the high costs associated with PPAs, the investors behind these projects are predominantly larger Kenyan or international companies.

All stakeholders welcome the inclusion of mini-grids in rural areas, as small energy projects are seen as spurring rural development. However, while the electricity regulator thinks the REFiT is sufficient in its own right to increase rural electrification, others feel that additional support is needed. All existing micro-hydro mini-grids have been established outside the REFiT and no PPAs have yet been approved under the REFiT. A major reason for this development is the limitation of eligible technologies for mini-grids to solar PV, which is still the most expensive renewable energy technology. As all capital costs and risks are borne by the developer, there are more barriers than incentives for resource-poor communities to invest in REFiT projects.

The REFiT also has negative effects for urban communities, at least in the short term. As 70% of the cost of the REFiT tariff is passed through to the consumer (85% for solar), prices for electricity are rising. However, interviewees did point out that in the medium-term, falling technology and transaction costs, as well as moving away from emergency thermal generation in the dry season, will have the reverse effect, and consumer electricity prices will go down.

Another positive effect of the REFiT is its stimulation of the local economy. While most of the local contributions are currently limited to low-technology areas such as steel, concrete and unskilled labour, Kenya also boasts the first manufacturer and supplier of solar modules in the East African Community, Ubbink.[6]

OUTLOOK

At time of writing, the REFiT policy is under revision for a second time following criticism from investors and developers.[7] High on the agenda is the formulation of a standardized PPA for projects under 10MW and a partly-standardized PPA for larger projects. This was a key recommendation from the Energy Regulatory Commission to reduce costs for small-scale projects, along with net metering and 'electricity banking'.[8] This could potentially include households in the REFiT, as currently the 500kW minimum project size is often too big for even the village level.[9] Tariffs are also to be adjusted so the rate of return will be proximately 18% after tax.10[10] Both measures could greatly increase the number of PPAs and the range of actors able to invest, especially for small or community projects.

The government is also bringing down the costs of feasibility studies through the publication of a wind atlas as well as providing insurance policies for the early phases of more risky projects.[11] Access to affordable finance remains a problem, but banks are beginning to accept PPAs as a secure investment, without needing further guarantees from the utility. Furthermore, the Kenya Association of Manufacturers has established a special fund accessible for its members investing in renewable energy projects under the REFiT.[12] The fund is also intended to support projects in Uganda and Tanzania.

While the Kenyan government may have been over-optimistic in its predictions for year-on-year increases in generating capacity[13], benefits are beginning to accrue. All local sectors – utilities, finance, engineering, and manufacturing – are slowly building capacity, which will further increase as more projects come online. However, the current REFiT policy is not tailored to serve the energy poor, and desirable policy amendments for this objective, such as widening the technology choice under mini-grids or providing concessional finance, are unlikely to materialise any time soon.

6 See http://www.ubbink.co.ke/

7 Energy Regulatory Commission (ERC) increases tariffs for solar PV, geothermal and biogas http://www.theeastafrican.co.ke/news/Solar-power-generators-to-sell-to-national-grid/-/2558/1669920/-/item/0/-/hohdrez/-/index.html

8 A small-scale project is defined as under 10MW, while electricity banking is similar to net metering, but rather than being paid for surplus electricity generation, it is 'banked' by the utility, to be used at a later date by the consumer. This is appropriate for domestic and industrial KPLC customers, as long as generation is equal to consumption in the long-run. See glossary or ECA, Ramboll, 2012.

9 Future grid connection may make this more attractive for communities.

10 Currently the rate of return is adjusted to 12% after tax.

11 This is in conjunction with MunichRE and specifically covers geothermal, although could be applied to other projects.

12 See http://www.kam.co.ke/index.php/kam-services/energy-services/regional-techical-assistance-programme

13 The Ministry of Energy assumed that following the policy adjustment capacity would grow at 100MW year-on-year, although to date only two projects totalling 5.92MW have been completed in four years.

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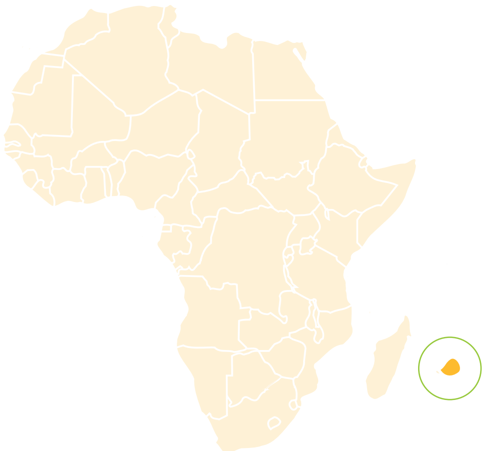
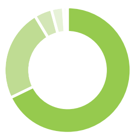
Mauritius

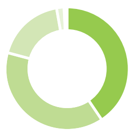




Energy Mix

Source: Republic of Mauritius

- **Petroleum products =** 67.97%
- **Electricity =** 23.54%
- **Bagasse =** 4.55%
- **Coal =** 3.08%
- **Fuelwood =** 0.82%
- **Charcoal =** 0.05%



Electricity Generation Mix

Power plant installed capacity
Total in 2012: 2.730 TWh

- **Coal 1.108 TWh =** 40.6%
- **Oil 1.058 TWh =** 38.8%
- **Bagasse 0.489 TWh =** 17.9%
- **Hydro 0.056 TWh =** 2.1%
- **Landfill gas 0.003 TWh =** 0.1%
- **Wind 0.0028 TWh =** 0.1%

Electricity Stats

Electricity consumption per capita = 1,725 kWh

Electrification Rate

National = 99.4%

BACKGROUND & POLICY DRIVERS

Mauritius, a small island state in the Indian Ocean, is unique among the countries studied in this book. Over 99% of the 1.3 million inhabitants are grid-connected, and the country scores almost 50% above the Sub-Saharan African average on the UN Human Development Index.[1] As an island, it cannot rely on neighbours for electricity, and instead relies predominantly on imported coal and oil for generation. However, Mauritius has also established independent electricity generation from sugarcane bagasse, which now accounts for almost 18% of overall installed capacity.

The policy shift towards renewable energy[2] arrived in 2008 with the appointment to special advisor the Prime Minister of Joel de Rosnay, a strong advocate of sustainable development and decentralised power production His programme “Maurice Ile Durable” (MID, Sustainable Island Mauritius), aims to transform the country by 2028. It aims for partial energy autonomy from imported fossil fuels by significantly increasing the share of renewables in Mauritius[3] and enhancing energy efficiency, among other transformative goals[4]. It is paid for through a carbon tax on fossil fuels channelled into the newly-created MID Fund (MIDF).[5] The programme received strong support by the Prime Minister from the outset and gained more support within the government as oil prices rose to record levels in 2008. The MID’s political importance was underlined further by the creation of a Ministry for Renewable Energy and Public Utilities under the control of the Deputy Prime Minister, and its further development into the Ministry for Environment and Sustainable Development.[6]

1 Mauritius scores 0.728 according to UNDP, 2012. The Sub-Saharan African average is 0.463.

2 Elahee, K., 2010.

3 Ibid. The initial objective was a share of 65% renewable energy, but the government reduced it to 35% in 2009.

4 For more information, see http://www.gov.mu/portal/sites/mid/index.html

5 For a detailed description of all the sustainable development activities covered by the fund, see http://www.gov.mu/portal/goc/mpu/file/ile.pdf

6 Elahee, K., 2010.

Rosnay’s vision was to not only connect everyone on the island to the grid, but to also enable them to supply its electricity. However, large amounts of electricity from fluctuating sources like solar PV and wind would threaten grid stability, so special care had to be taken to avoid such problems. As a first step, a rigorous grid code was drawn up in 2009, detailing the technical requirements for new plants wishing to connect to the national grid. As a second step, a REFiT structure was developed with the help of Danish consultants. Taking into account the grid’s limited absorption capacity and the low level of available funding for the REFiT through the MIDF, the consultants proposed a net metering scheme with an overall cap of 2MW and a maximum size of 50kW for individual generators, which was introduced in late 2010.

Both the grid code and the REFiT policy were developed with input from the private sector and civil society. However, while the private sector participants in consultative workshops had the advantage of experience with existing bagasse power plants, the civil society representatives generally lacked the specialist knowledge to contribute much to the technical debate. However, communities and the energy poor were not represented at all in the discussions.

KEY AND UNIQUE FEATURES

Preference for household-level generation

The incentives of the Mauritian REFiT are clearly geared towards national, small and household-level producers, rather than external investors looking for profitable projects. Firstly, only existing grid-connected utility customers are eligible for the REFIT programme, not new green-field project developments. Secondly, generation from bagasse – a technology already deployed on the island by plantation owners – is excluded from the scheme. Thirdly, the maximum size for eligible plants is limited to 50 kW. Finally,

Table 1. Mauritius REFiT Design Features

FIT Design Features	Mauritius			
Integration with Policy Targets	• 35% from renewable energy by 2025 as per the Long Term Energy Strategy 2009-2025 • 17% from bagasse • 2% from hydro • 4% from waste to energy • 8% from wind • 2% from Solar PV • 2% from Geothermal			
Eligibility	PV (< 50 kW) Wind (< 50 kW) Hydropower (< 50 kW)			
Tariff Differentiation	Technology and size	Tariff in MUR/kWh	Tariff in $US/ kWh	Greenfield Tariff in MUR/kWh
	• PV (< 2.5 kW): • PV (2.5-10 kW): • PV (10-50 kW): • Wind (< 2.5 kW): • Wind (2.5-10 kW): • Wind (10-50 kW): • Hydro (< 2.5 kW): • Hydro (2.5-10 kW): • Hydro (10-50 kW):	• 25 • 20 • 15 • 20 • 15 • 10 • 15 • 15 • 10	• 0.826$ • 0.661$ • 0.496$ • 0.661$ • 0.496$ • 0.330$ • 0.496$ • 0.496$ • 0.330$	• 21.25 • 17 • 12.75 • 17 • 12.75 • 8.50 • 12.75 • 12.75 • 8.50
Payment Based On	Cost-based on IRR of 6-8%			
Payment Duration	15 years			
Payment Structure	Electricity consumed onsite offsets retail power; electricity exported to the grid receives the FIT payment. If the amount exported is more than 3 x higher than the amount consumed onsite, then the following year the generator will automatically be switched to the greenfield tariff (15% lower)			
Cost Recovery	The Maurice Ile Durable fund, which is funded through tax revenues			
Interconnection Guarantee	Generators must pay for the cost of interconnection and necessary grid upgrades			
Interconnection Costs	Grid operator pays for interconnection and recovers costs from pass-through			
Purchase and Dispatch Requirements	Guaranteed purchase if technical requirements are met			
Amount Purchased	Net electricity output			
Purchasing Entity	Utility			
Commodities Purchased	Electricity only			
Triggers & Adjustments	Stop and revise programme after 2 MW of extra installed capacity or 200 installations, whichever comes first			
Contract Issues	Standard contract			
Payment Currency	MUR			
Interaction with Other Incentives	None			

the tariffs are calculated based on the actual cost of household installations with a moderate return on investment of 6-8%. Because of the higher costs of small scale installations, the resulting tariffs are 3-4 times higher than in most African countries, with larger installations receiving lower tariffs.

On-site consumption for energy independence

The net metering mechanism chosen requires participating households and businesses to use the electricity produced for on-site consumption before selling any excess to the grid. While this policy may be less profitable for the generator than a REFiT without net metering[7], it encourages lower consumption at household level and helps raise awareness about the need to conserve energy more generally. This is also reflected in tariff levels, which are 15% lower for generators selling more than three times the energy they consume on-site.

Financing

The costs of the REFIT are covered by the Maurice Ile Durable Fund (MIDF). This mechanism is popular with the citizens, as it does not increase the financial burden on consumers, as is the case in many other countries. As the MIDF is funded through a carbon tax, it also underlines the government's commitment to moving away from fossil fuels in spite of opposition from coal and oil shipping interests. However, if the use of fossil fuels were to decrease, so would the tax base for the MIDF, which poses a challenge for the long-term financing of the REFiT.

EXTERNAL FACTORS

Mauritius is consistently ranked as one of the most transparent and well-governed countries in Africa[8]. Apart from an out-dated regulation that requires all power producers to be approved by the President, this also applies to the REFiT. The REFiT application process has been designed to be straightforward, limiting the point of contact for new power producers to the Central Electricity Board (CEB). The CEB itself has made all efforts to speed up the process by developing and implementing clear guidelines.

The main reason for delays is thus technical rather than administrative. The promotion of small-scale production means large numbers of individual units and consequently a high demand for local expertise in order for projects to meet the technical standards set by the grid code. However, Mauritius lacks the professional advisors and technicians for eligible technologies. According to an insider, many domestic users thus do not use professional companies for planning and installation and therefore fail to meet the code standards. The lack of local expertise also leads to laypeople purchasing poor quality technology. Such issues cause delays in the overall process and undermine confidence in renewable technologies and supporting policies.

IMPACTS

As of September 2012, approximately 20 projects are in operation with more - predominantly solar PV - in the pipeline. The initial cap of 2 MW of newly installed capacity was reached within four months, demonstrating strong support and high demand for the scheme. Stakeholders agree that the REFiT has raised awareness among the population as to the benefits of renewable energy.

Consequently, the cap for newly installed capacity has been increased twice to 3 MW and finally 5 MW. The additional capacity has been divided between domestic (1MW) and commercial (2MW) applicants, with commercial users now allowed to exceed the initial plant size limit of 50kW. Commercial producers account for a far greater proportion of total generated capacity and the participating households tend to be from higher

7 Under REFiT without net metering, power producers are able to sell all of their renewable electricity back to the grid at the fixed higher tariff, and then purchase electricity for their own consumption back from the grid at lower retail prices.

8 In 2012, as in every year since 2006, Mauritius ranked first of all African countries in the Mo Ibrahim Index of African Governance. See Mo Ibrahim Foundation, 2012.

income groups. The high upfront costs and lack of financial support for installation are significant barriers for poorer households.

The lack of local technical capacity and the poor quality of imported technology is holding Mauritius back, as the large number of applications and the small number of projects in operation demonstrates. However, there has already been an improvement since the REFiT policy was launched and first companies offering local expertise have been established. Furthermore, Mauritius has taken a holistic and long-term approach to the shortage of expertise by integrating both general awareness raising and the development of specialised technical skill-sets into the national education curriculum.

OUTLOOK

The Mauritian government has set an ambitious goal to generate 35% of its energy from renewable resources, but until the government's Master Plan for Renewable Energy is released, it remains unclear how the REFiT will contribute to this objective. Currently, the capacity developed under the REFiT accounts for only 1% of the country's total capacity and the government's Long-Term Energy Strategy aims for a share of only 2% for solar PV by 2025. The existence of a cap on eligible capacity under the REFiT obviously limits the policy's potential, but with a 4% annual growth in electricity demand[9] the government's current focus is ensuring the high number of projects already approved actually come on-line. A review of the REFiT is planned and some stakeholders expect a further increase of the programme's total capacity to 10 MW, but the scheme is under threat from large wind and solar power projects (30 and 10 MW respectively) in the pipeline. If these go ahead as planned, the limited capacity of the grid to accommodate fluctuating energy sources like wind and solar PV would make increasing this further under the REFiT impractical.

If the government is serious about meeting its target and sees the REFiT as part of the solution, it may need to explore financing options beyond the MIDF. This may matter less in the medium term, as some local energy experts believe that rising fossil fuel prices and falling technology costs could make solar PV economically competitive within 5-10 years. Demand reduction policies can also prove complimentary in bringing down generation requirements and therefore overall policy costs. If combined, they could allow fossil fuel generation to be affordably replaced by renewable technology, rather than being used to meet increased demand. However, whether this is achieved through small-scale generation or larger projects will depend as much on commitment to the transformational principles of the MID as it will on technical capacity.

9 Agence Française de Développement. (2012)

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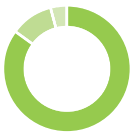
Rwanda



Energy Mix
2008

- **Biomasss (57% wood, 23% charcoal, 5% peat)** = 85%
- **Petroleum Products** = 11%
- **Electricity** = 4%

Source: Ministry of Infrastructure, 2011: p. 25.

Electricity Generation Mix
Power plant installed capacity
99.5MW

- **Hydroelectric 57MW**
- **Diesel 40MW**
- **Methane to Power 1.80MW**
  Solar 0.25MW

Source: Ministry of Infrastructure, 2011: p. 51.

Electricity Stats

Electricity consumption per capita = 20 kWh

Electrification Rate = 11%

Urban = 25% **Rural** = 1.3%

Source: Bensch, G., Kluve, J., Peters, J., 2010: pp. 4, 7.

BACKGROUND & POLICY DRIVERS

The Rwandan population depends heavily on biomass (firewood and charcoal) for its energy needs. Electrification rates are low, especially in rural areas. The country's low generation capacity requires significant electricity imports on a permanent basis. Rwanda's own production largely relies on hydropower, which led to severe load shedding during the 2004-06 regional drought. Diesel generators, initially rented as an emergency measure in response to the crisis, still supply as much as 40MW.

Under its Vision 2020 (released in 2000) and subsequent Economic Development and Poverty Reduction Strategy (EDPRS), the government wants to turn Rwanda into a knowledge-based, middle-income country by 2020. The plan relies on improving access to affordable modern energy services. Increased small-scale renewable energy generation, grid expansion and off-grid programmes are intended to meet existing and future demand as well as bring social, environmental[1] and economic benefits.

There is a strong emphasis on private sector participation, but the reversed process of energy market liberalisation shows the state will still play an important role. The state no longer holds the monopoly on generation, allowing private generation into the grid in 1999 at the same time as privatising ELECTROGAS, but it has now renationalised the public electricity utility and in 2010 brought the management of water, sanitation, sewage and energy back into one organisation, the Energy, Water and Sanitation Authority (EWSA). The Rwanda Utilities Regulatory Agency (RURA) was created during the process, and between them they have taken on some of the responsibilities previously held by the Ministry for Infrastructure (MININFRA). While MININFRA develops policies, RURA regulates and EWSA implements them.

In 2006, after two years of drought, severe load-shedding and faced with the high costs of diesel powered electricity generation, the government launched a tender for renewable energy generation to diversify and improve the country's power generation. However, the tariff of 60 RF (roughly US$ 0,10 in 2006) set by the Rwandan Utilities Regulatory Agency (RURA), ultimately proved financially unsustainable, leaving international development organisations to subsidise new projects by up to 60%. Another reason for the failure of the tender process was the lack of coherence with larger government policies. Lessons were learnt in the years that followed, as the government of Rwanda formulated a clear energy policy in its EDPRS development strategy, which was further refined in the National Energy Policy and Strategy published by the Ministry of Infrastructure in 2011. The strategy established the newly formed state utility Energy, Water and Sanitation Authority (EWSA) and explicitly mentioned feed-in tariffs to promote renewable energies.

EWSA immediately began conducting a REFiT study and proposed a tariff based on generation costs and a reasonable return on investment. RURA had conducted a similar study a year earlier - when it was still responsible for tariff-setting - based on avoided cost. With different policy designs available, MININFRA ran two stakeholder workshops with civil society, private developers and the public sector to decide which policy to choose. Considering the ambitious goals of Vision 2020 and the need for more generation, EWSA's proposal was deemed more suitable to attract investment. While EWSA was criticised for increasing the prices for end-consumers, an evaluation showed that the model was cheaper in the long-run. Other positive aspects included faster growth of available capacity, reduced dependence on expensive diesel, and more decentralised generation helping to reach more customers, as well as support grid stability.

1 Alongside agriculture, housing and clearance for tea plantation, fuel usage is a main driver of deforestation in Rwanda, which has lost two thirds of its tree cover since 1950. See Ministry of Infrastructure, 2011: p. 25.

Table 1. Rwanda REFiT Design Features

FIT Design Features	Rwanda		
Integration with Policy Targets	By 2012 - EDPRS: • Increase Energy access from 6% in 2000 to 16% • Double the electrification rate • Installed capacity of 130 MW • Reduce electricity prices By 2017 - EDS: • Increase generation capacity to about 1,000MW By 2020 – Vision 2020: • From 6% in 2000 to 35% grid connection • Decrease share of wood in the national energy consumption from 94% in 2000 to 50%		
Eligibility	Hydro (0.5 – 10MW) – Attractive hydro-projects outside this range may apply as well.		
Tariff Differentiation	Technology	Tariff (In US$) per kWh	Plants installed capacity
	• Hydro Power	• 0.166 • 0.161 • 0.152 • 0.143 • 0.135 • 0.129 • 0.123 • 0.118 • 0.095 • 0.087 • 0.079 • 0.072 • 0.071 • 0.070 • 0.069 • 0.068 • 0.067	• 50 kW • 100 kW • 150 kW • 200 kW • 250 kW • 500 kW • 750 kW • 1 MW • 2 MW • 3 MW • 4 MW • 5 MW • 6 MW • 7 MW • 8 MW • 9 MW • 10 MW
Payment Based On	Costs plus return before any CDM benefits.		
Payment Duration	Negotiable		
Payment Structure	Fixed		
Cost Recovery	Not mentioned in the policy		
Interconnection Guarantee	Interconnection is guaranteed if the project is within 10km of the national grid. Projects beyond 10km may apply under certain circumstances.		
Interconnection Costs	Grid operator pays for interconnection and recovers costs from pass-through		
Purchase and Dispatch Requirements	Right of way for power producers		
Amount Purchased	Negotiable		
Purchasing Entity	Transmission System Operator or third party.		
Commodities Purchased	Electricity and CDM unless otherwise negotiated.		
Triggers & Adjustments	Tariffs are adjusted to US$ Producer Price Index and differential inflation on an annual basis; Revision of the policy after three years while tariffs only can be adjusted upwards.		
Contract Issues	Negotiated on a case-by-case basis		
Payment Currency	Rwandan Franc equivalent to US$ rates.		
Interaction with Other Incentives	None		

Unfortunately, initial plans to include several technologies in the REFiT were dropped and only small hydro plants (50kW to 10MW) are now eligible for support. One reason behind this decision is the fact that RURA, which was still responsible for approving the REFiT tariffs, had no experience with other technologies and would have taken a long time to review proposals for solar PV, wind or biogas. Delays in the publication of the policy could have undermined investor confidence, or worse,threaten the projects already in the pipeline.

KEY AND UNIQUE FEATURES

Clean Development Mechanism

All rights to extra payments for carbon credits under the UN Clean Development Mechanism belong to the government of Rwanda. Thus, the developer has to calculate the feasibility of a project without the possibility of additional income from selling the emissions savings on a global market. However, a study revealed that due to the costly and lengthy process of certification, it would be economically feasible for only 3.3% of the possible hydropower sites in Rwanda,[2] and perhaps even less given the continuously low prices on the global carbon market.

Eligibility

The REFiT only applies to small hydro plants up to 10MW, but within that range the tariff is highly differentiated. Smaller plants will receive more income per kWh than larger plants, making them more feasible and thus favouring local developers. This is in line with Rwanda's wider push for small-scale decentralised generation to stimulate local economic development. Projects will be approved until a combined total capacity of 50MW is reached. Should there be no negative influence on grid stability, which would be unlikely given the small scale of generation, this cap may be raised in the future.

Payment

While the policy defines the tariffs in US$ (unless the project is financed in local currency),[3] the actual payments are made in local currency converted on the basis of current exchange rate.[4] This allows Rwanda to save its foreign exchange for other purposes, such as servicing debt or buying diesel, and favours local project developers and investors. However, this approach adds uncertainty for international investors due to fluctuating exchange rates.

EXTERNAL FACTORS

Rwanda is known as the land of a thousand hills and due to this topography the costs for extending the grid and connecting new users are extremely high.[5] A Universal Access Fund, financed by the government, international donors and EWSA, is in place to help fund the roll-out of electrification.

As in most countries on the continent, access to finance is described as the main barrier by

2 Uhorakeye, T., 2011: p. 65.

3 Republic of Rwanda, 2012: art. 31. §1.
4 Ibid., §2.
5 The actual costs for new extensions are as high as US$ 1,200. However, the government provides subsidies to limit the costs for consumer US$100 per connection.

all stakeholders. Existing projects have experienced payment delays and the uncertain creditworthiness of the utility undermines trust in the security of PPAs. Without a credible guarantee project developers, and communities in particular, struggle to raise sufficient funds.

The lengthy application process is complicated by a lack of standardised PPAs, a large number of involved actors and frequent changes of responsibility between institutions. This situation causes long and often costly delays, in particular for developers located far away from the relevant government authorities situated in the capital.

On the technical side, local production is limited to a small number of workshops producing pico-hydro turbines. However, the government's rural electrification drive,[6] which is focused on micro-hydro, solar and wind, is likely to boost demand and encourage growth in the sector. To build the necessary technical skills, the government plans to work with local technical schools as well as sending staff for more specialised training programmes abroad. The NGO Global Village Energy Partnership has already conducted an assessment of Rwanda's pico-hydro value chain potential, and is working with government to implement the findings.[7]

IMPACTS

At the time of writing, two projects were operating under the REFiT, with 100kW and 500kW of installed capacity. However, they were already operating before the policy was issued and only switched from the old tariff of 60RF to the higher REFiT. Some developers have signed memorandums of understanding for new projects with the government, but the policy is too recent to expect operational projects already.

6 The EDPRS aims, by 2012, to: provide off-grid solar systems to provide electricity to all health facilities, local administration offices and more than 50% of all primary and secondary schools; reach 10,000 off-grid energy users; reach 16% of the population. By 2020 it aims to reach 36% of the population.

7 Bakri, 2011

The REFiT was rushed through quickly and important issues were not properly addressed. The bureaucratic processes should be streamlined and finance institutions must be convinced to accept PPAs as collaterals for investment loans.

There is disagreement between stakeholders on whether the REFiT will benefit communities. Despite the REFiT incentivising smaller installations, an associate from a donor organisation predicts there will be little community involvement. However, a number of interviewees point out that communities are already taking an interest in the policy, and at least two projects are already planned which could involve community ownership.

OUTLOOK

There is widespread regret that the REFiT only applies to hydropower projects. While tax breaks on solar PV, solar heating and wind are already in place,[8] all stakeholders interviewed have been calling for the inclusion of more technologies in the REFiT to provide additional incentives for local developers. A first solar PV plant is already feeding into the grid and the Belgian government is producing a national wind atlas. Projects using geothermal energy are also being discussed, as they can provide significant base-load power to replace the expensive diesel generators and bring down overall prices.

Rwanda's REFiT is a first and encouraging step. However, to maximise its effectiveness, it should be better integrated with other policies – especially on rural electrification, as the government has announced its support for off-grid solutions.[9] However, the government's strong political will and the widespread support for the REFiT among all stakeholders provide a sound basis for further policy improvements and a successful implementation.

8 Republic of Rwanda, 2006 and 2010.

9 "At the same time, self-contained off-grid schemes are encouraged: these can be owned and operated by EWSA or by private developers." Ministry of Infrastructure, 2011: p. 31.

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South Africa

Energy Mix
2006

- **Petroleum Products** = 34%
- **Electricity** = 28%
- **Coal** = 27%
- **Renewables and Waste** = 7%
- **Gas** = 4%

Republic of South Africa, 2009.

Electricity Generation Mix

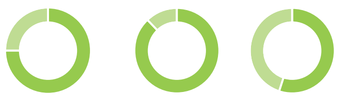
Power plant installed capacity
47,003.45 MW

- **Coal** 37,745 MW
- **Gas** 2,226 MW
- **Nuclear** 1,910 MW
- **Pumped storage hydro** 1,400 MW
- **Hydro (large & small)** 600 MW
- **Bagasse/coal hybrid** 105 MW
- **Wind** 8.2 MW
- **Landfill gas** 5 MW
- **Waste water/biogas** 4.25 MW

Electricity Stats

Electricity consumption per capita = 4,532 kWh

Electrification Rate



National = 75% **Urban** = 88% **Rural** = 55%

BACKGROUND & POLICY DRIVERS

In 2008, South Africa faced significant load shedding due to economic growth and rural grid extension.[1] This problem will further increase as energy demand is rapidly rising. Official figures show that 75% of the population are connected to the grid, thanks to an electrification drive between 1990 and 2007. However, while poor households receive a free monthly quota of 50 kWh, this only covers a fraction of their electricity needs. Given that households are billed more than three times the price paid by the extractive industries[2] for their remaining needs, affordability remains a serious issue for many South Africans.[3]

South Africa is heavily reliant on coal-based electricity generation. With about 80% of total installed capacity coming from coal-fired power stations, the country is responsible for over 40% of the continent's greenhouse gas emissions and one of the largest emitters worldwide.[4]

South Africa's government has publicly stated that it accepts the need to reduce greenhouse gas emissions and to diversify the energy mix, and has also welcomed the economic potential of a local renewable energy industry. However, it is also under great pressure to quickly increase overall electricity production in order to reassure the business community and maintain its current economic growth trajectory. This means that on the one hand, parliamentarians, the business sector and civil society have successfully pushed the renewable agenda,[5] but on the other, the state-owned utility Eskom is currently developing two additional coal-fired power plants, Kusile and Medupi, which will be among the largest in the world.[6] To meet increasing demand, the Department of Energy (DoE)has also developed a new long-term 'Integrated Resource Plan 2010-30 for Electricity', mandating an additional 17,800 MW from renewables by 2030[7] – but also committing to build six new nuclear reactors with a total capacity of 9,600 MW, paid for through further residential price increases.[8] As of 2011, the national policy goal is to achieve a 10% share of total installed capacity for wind and PV technologies by 2020, and 20% by 2030.[9] According to the Electricity Regulations on New Generation Capacity, 30% of the additional generation capacity must be implemented by Independent Power Producers (IPPs) and municipalities.[10]

FROM REFIT TO BIDDING PROCESS

A broad coalition of politicians,[11] NGOs, academics, business leaders, the renewable energy industry, local governments and community campaigners managed to overcome stiff opposition in the South African Parliament, the DoE and Eskom to successfully promote the idea of a REFiT. In 2007, the National Energy Regulator of South Africa (NERSA) produced an initial REFiT study. After two years of multi-stakeholder consultations and eventually saw the South African government officially introduced the country's Feed-in Tariff Policy. However, before the REFiT could really take off, the government repealed its decision and instead introduced a public bidding process to promote renewable energy. While official

1 Thabethe, E., 2010.
2 Hallowes, D., 2009.
3 Research by Earthlife Africa Jhb shows that 50kWh per month is enough to provide between 14-19% of the energy needs of a poor household (heating, cooking, communication), see EAJ, 2012.
4 United Nations Statistics Division, 2012.
5 This pressure led to the then-Department of Minerals and Energy (DME) to publish a Renewable Energy White Paper in 2003, setting a target of 10,000 GWh of renewable energy generation by 2013. The sources of generation were bagasse (59%), solar water heating (13%), hydro (10%), landfill gas (6%), other biomass (1%) and wind (1%).
6 Hallowes, D., 2009.
7 This includes 8,400 MW from wind, 8,400 MW from solar PV, and 1,000 MW from CSP, see Department of Energy, 2011:Electricity Regulations on the Integrated Resource Plan 2010-2030.pages 6 and 11.
8 groundWork, 2012: Comments on Eskom's Revenue Application for MYPD 3. Submitted to NERSA
9 Department of Energy, 2011: Electricity Regulations on the Integrated Resource Plan 2010-2030.
10 Department of Energy, 2011: Electricity Regulations on New Generation Capacity.
11 Dr. Ruth Rabinowitz, of the Inkatha Freedom Party, established the E-REACT Parliamentary group (e-Parliament Renewable Energy Activists) to press for government action, in particular for the tariff to be signed into law

explanations of this surprising change of policy are scarce, the policy may have been threatened by its own success. On a technical level, a large number of wind power plants with fluctuating energy production could have posed challenges to grid stability. On an administrative level, the flood of applications may have overwhelmed the understaffed authorities and could have led to even longer delays than currently experienced under the bidding process. On a political level, while NERSA may have favoured the REFiT there was less support from Eskom and the Department of Energy. Finally, the REFiT's guarantee to buy all renewable electricity – combined with falling prices for solar PV – seems to have raised fears in the treasury about an unchecked growth of expenses and poor value for money.

Under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), prospective developers follow a tendering rather than a first-come, first-serve allocation process. This allows Eskom more control over installed capacity and related costs, and – due to its preference for larger power plants – reduces the technical adjustments to the existing grid infrastructure. It is anticipated that there will be five rounds of bidding under the programme. Bidders are required to specify a tariff for the electricity produced that should not exceed the cap set out in the procurement documentation[12] (see table 1).

Table 1: Maximum tariffs of South Africa's REIPPP programme

Technology	ZAR/MWh	USD/kWh
Onshore wind	1,150	0.1416
Solar PV	2,850	0.3509
Concentrated Solar Power (CSP)	2,850	0.3509
Biomass	1,070	0.1318
Biogas	800	0.0985
Landfill gas	840	0.1034
Small hydro	1,030	0.1268

12 Department of Energy, 2012:p. 4.

No additional consultations were held for the REIPPPP, but NERSA claims that the programme has been informed by the outcomes of the workshops held for the REFiT. However, issues such as retail price levels, grid access, development of off-grid areas and social impacts did not receive much attention in the eventual bidding policy. The REIPPPP sets a minimum capacity size of 1 MW and does not cover off-grid projects. Direct sales to municipalities are not allowed, which excludes potential micro-scale (household level) or community-scale projects from eligibility.

The REIPPPP process lacks transparency for all but those project developers who are directly involved. A non-refundable application fee (ZAR 15,000, approx. €1,400) is charged just to see the bidding documents and, according to an interview partner with close links to South Africa's renewable industry, developers are even made to sign a non-disclosure agreement. This has further compounded the impression from many civil society groups that the bidding process is opaque and unaccountable.

KEY AND UNIQUE DESIGN FEATURES

Local content

One important aspect of the Renewable Energy IPP Procurement Programme is the requirement of local content for both equipment/material and services. This means that a certain percentage of goods and services must be procured from local (i.e. South African) manufacturers and service providers. Local content requirements are aimed at increasing the benefits for the local economy and could potentially create jobs and reduce

South Africa's high unemployment rate. In the second round of bidding, the percentage of local content must equal or exceed 25% of total project costs (35% in the case of solar PV and Concentrated Solar Power without storage); higher percentages of 40% and 45% apply for the third round. South Africa expects to promote local manufacturing in the following sectors: wind turbine blades and towers, PV modules, PV inverters and metal structures used in PV plants.[13]

Economic development scorecard:

A related aspect of the bidding process is that candidate projects are evaluated against an economic development scorecard, linked to the country's Broad-Based Black Economic Empowerment (BBBEE) law. The BBBEE, which applies to all government tenders, is an affirmative action to remedy the inequality caused by apartheid and to distribute wealth across as broad a spectrum of South African society as possible. Requirements include minimum levels of black representation among management and employees as well as ownership.

EXTERNAL FACTORS

The BBBEE requirements include a minimum ownership share of 2.5% to be held by local communities.[14] However, as IPPs do not have shareholders, this has led to the formation of community trusts within a 50km radius of the planned generating site. This may prove problematic. Firstly, while community trusts will receive loans from national development banks to pay for equity in the IPP, there is a big question whether they will be liable to repay the money if the project is unsuccessful in the bidding process, a likely prospect given the cap on overall funding. Secondly, if the project is successful, it may lead to even greater problems: trustees can be anyone from within the 50km radius and the trusts

13 Department of Energy, 2012: p. 6.

14 Department of Energy, 2011: Tender No: DOE/001/2011/2012. Request for qualification and proposals for new generation capacity under the IPP procurement programme. Volume 5: Economic Development Requirements. p. 21.

have no defined governance structure, which leaves ample room for irregularities and corruption.

The lack of local skilled labour and manufacturing capabilities in the energy sector have been recognised by government as a barrier. The Energy Sector Education and Training Authority was established in 2000 to address this problem. However, although it is supposed to provide training grants, paid for through an industry-wide levy, most of the funds remain unspent. This limits the ability of South Africa to ensure as many parts of the value chain remain in the country as possible.

From the project developers' perspective, the new tender process adds more requirements and paperwork and may lead to protracted PPA negotiations. This favours larger IPPs in the bidding process, as they have the capacity to absorb the extra costs. The non-refundable application fee also discourages smaller, community-led projects from participating in the process.

Moreover, cumbersome programme administration has led to serious delays exceeding the timelines initially set, forcing investors to extend financial guarantees for the project at additional cost, and thus undermining the economic forecasts on which the bid succeeded.

IMPACTS

The initial abrupt shift away from a REFiT policy sent confusing signals regarding planning and stability of renewable energy policy in South Africa, resulting in uncertainty for investors.[15] According to one energy commentator, project developers were angry at the switch and even sought legal action as they had already started their environmental impact assessments (EIAs) and purchased land on the basis of the originally planned REFiT.

15 Fakir, S., undated.

Nevertheless, since the attractive REIPPPP tariffs were published, the bidding process has been heavily over-subscribed. In the first phase of bidding for 3,750 MW of renewable energy expected to come online by 2016, the government received more than 400 applications.[16] Of these, 28 bidders and 1,400 MW were approved followed by a further 19 projects totalling 1,000 MW in phase two, spread among wind (mainly off-shore), solar PV, CSP and small hydro (1-10 MW).[17] The first 'window' was concluded at the end of October 2012, a full year after announcing the winners, with the government blaming the delay on administrative issues.[18] The second bid is expected to close in March 2013, with the third bid delayed until the following year. There is already talk of some projects being re-financed, as the long delays were not factored into the bid and have made projects more expensive.

It is notable that although local developers are taking the lead on a number of projects, most consortiums have international backing/involvement, likely due to technical or financial capabilities. Further, the DoE has noted that some developers are having trouble achieving the requirements of local content and the economic development scorecard. According to research by WWF-South Africa, 69% of the materials used by developers in the first round of bids will be imported, while 96% of the 20,479 jobs created during rounds one and two will be short-term construction jobs.[19] This confirms the suspicion of many stakeholders that the 'added value' (high-tech materials and skilled labour) is taking place outside of South Africa through international firms. Most of the jobs that are not construction will still be low-skilled, such as mirror cleaning, catering or security. Others have reported that some specialised renewable energy BBBEE companies are being set up by elite South Africans to take advantage of the thresholds and therefore benefit from involvement in a number of projects, as there are few qualified firms available.

16 England, A., 2011.

17 NERSA, 2012.

18 Kings, S., 2012.

19 Fakir, S., 2012.

As no projects have yet been built due to delays, it is difficult to judge the impact of BBBEE policy on community trusts, but civil society stakeholders fear that social aspects will be side-lined as their related costs reduced the chances of a project to be chosen in the competitive bidding process. The non-profit organization Just Energy for example, which tries to help local communities own their share of renewable projects, has so far failed to have any of its IPP-partnered bids accepted.[20] Given the high up-front costs and the fact that smaller power plants below a capacity of 1MW are excluded from the programme, the BBBEE clearly aims at increasing production at the national level and is not designed to attract small or community-level producers. No municipalities are involved in REIPPPP to date, with all 15 of their power generators falling outside of the Programme.

The rise of electricity prices – already unaffordable for most of the poor – is an issue of constant national debate.[21] However, research shows that the impact of renewable energies on prices has been negligible. Wind power in the Western Cape Province is already 10% cheaper than electricity from two new coal-fired plants in Kusile and Medupi.[22]

OUTLOOK

The REIPPPP has the potential for local economic development if the right policies are pursued, including a more streamlined and transparent administrative process and a lower entry level for eligible plant sizes. South Africa has ample opportunities to create skilled jobs in the production of renewable technology components, and can even become a manufacturing hub. The establishment of the South African auto industry in the 1990s could serve as a role model. However, while an international power equipment supplier recently opened a local manufacturing facility in the Western Cape to produce solar inverters and electrical distribution boxes,[23] a wind turbine factory is shutting down due to lack of demand. Many interviewees have highlighted that, to realise the sector's manufacturing potential, the government needs higher targets for installed capacity, accompanied by an effective industrial strategy to drive demand for local materials and services.

20 Just Energy is a not-for-profit established by Oxfam with the Bank of America, see http://just-energy.org/

21 Prices have been increasing 25% year on year for the past three years, with the exception of this year, when the planned increase was reduced by NERSA to 16%. Eskom now plans to increase prices 16% (of which Eskom claims 3% are needed to purchase the electricity produced under the REIPPPP) by year on year until 2018, more than doubling current prices, see Burkhardt, P., 2012.

22 Gosling, M., 2012.

As civil society stakeholders have pointed out, the government currently concentrates on finding the cheapest possible route to renewable energy, thereby sacrificing many of the wider social and economic benefits. To have the greatest impact on local job creation, additional technologies, such as biogas, should be supported which create far more semi- and unskilled jobs. Local government authorities such as eThekwini Municipality[24] are already spearheading a move to promote small-scale "embedded" generation.[25] Combined with the roll-out of solar home systems that is underway, one stakeholder hopes this could form part of a wider, more holistic approach to delivering energy services to poor communities that looks beyond electricity to include solar water heaters and insulation, potentially funded through municipal participation in the REIPPP.

23 Minister opens SA's first utility-scale solar inverter factory. Seerenewables4africa, 2012.

24 Municipal Institute of Learning, 2012.

25 Small-scale (generally <10 MW) power plants connected at the distribution level that do not require central despatching, have simplified interconnection rules and contribute to low voltage stabilization.

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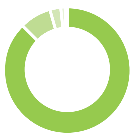
Tanzania



Energy Mix

Source: IEA 2009

- **Biomass** = 87.7%
- **Petroleum** = 8%
- **Natural Gas** = 2.8%
- **Hydro-electric** = 1.2%
- **Coal** = 0.3%

Electricity Generation Mix

Power plant installed capacity 939 MW

- **Hydro 561 MW** = 60%
- **Natural Gas 244 MW** = 26%
- **Oil 134 MW** = 14%

Electricity Stats

Electricity consumption per capita = 85kWh

Total Population in 2010= 43.2 million

Electrification Rate

National = 14%

Urban = 34%

Rural = 3%

BACKGROUND & POLICY DRIVERS

Tanzania's energy demand for heating, electricity, and transportation has been increasing with improved standards of living. To meet these growing demands, Tanzania has had to import a growing share of electricity from Zambia and Uganda, as well as petroleum from abroad. This is becoming increasingly expensive and straining the government's budget and foreign currency earnings.[1] Tanzania's national electrification rate lies at just 14% – with less than 3% in rural areas.[2] However, its domestic electricity supply is vulnerable. Much of its grid-connected electricity is generated through hydropower, which is susceptible to drought—for example, hydropower's contribution to overall electricity generation decreased from 65% in 2002 to just 24% at present.

Tanzania currently imports 10 MW and 3 MW of electricity from Uganda and Zambia respectively[3]. However, delivery from these partners has been inconsistent – in part because they both also depend on hydropower – and the country continues to suffer from frequent power outages. Many grid-connected consumers only have 4 hours of electricity per day.[4] The state utility TANESCO loses approximately US$1.9 million a month due to power outages, while the economy loses over US$6.3 million a year in productivity, meaning the government loses approximately US$1.5 million each year in lost corporate taxation.[5]

Tanzania began a program of energy market liberalisation in 1992 - introducing legislation that allowed independent power producers to sell electricity to the state utility TANESCO. The government's goal was to develop and increase the use of indigenous energy sources, as well as to increase per capita electricity access. However, the only two resulting IPPs, Songas and Independent Power Tanzania Ltd. (IPTL), took over a decade to build new generating capacity (gas and diesel respectively) and ultimately failed to prevent load shedding during the drought years. In 2003, responding to pressure from multilateral organisations such as the World Bank, who promoted the commercialisation and privatisation of energy development, the government issued a National Energy Policy, which laid the groundwork for subsequent legislation by unbundling the energy sector and providing public funding for renewable energy projects.[6] The Rural Energy Act of 2005 prioritised improved access to modern energy services in rural areas and established institutional infrastructure to provide technical assistance, finance, and capacity-building to developers and communities,[7] while the Electricity Act of 2008 allowed for IPPs to supply power directly to consumers.

Once IPPs had the right to transmit, distribute, and supply power directly to consumers, the Ministry of Energy and Minerals created the Small Power Producer (SPP) program in 2009, within the Tanzanian Energy and Water Utilities Regulatory Authority (EWURA). With the support of international donors, the Ministry of Energy and Minerals drafted the Standardised Power Purchase Agreements and Tariffs (SPPA/T) and developed comprehensive guidelines, rules and model documents to promote small grid and off-grid power producers and distributors. These documents underwent an approval process, which included public hearings. Civil society organisations, such as the Tanzania Renewable Energy Association (TAREA), who had been pushing the government to develop a REFiT for small producers, were initially pleased with the development of the SPP. However, during the hearings they expressed displeasure with a REFIT policy they felt

1 Although petroleum is only 8% of the total energy supply, it costs the country 30% of its foreign currency earnings. Mrindoko, B. J., 2009.

2 The primary energy source for many Tanzanians is biomass, which is associated with many health hazards. Burning biomass for energy presents a fire hazard as well as carrying the risk of smoke inhalation. International Finance Corporation, 2011.

3 TANESCO, 2012

4 International Finance Corporation, 2011

5 The Citizen. February 13, 2011

6 Lyimo, 2005/2006

7 The Rural Energy Act of 2005 established the Rural Energy Board (REB), the Rural Energy Fund (REF), and the Rural Energy Agency (REA).

Table 1 Tanzania REFiT Design Features

FIT Design Features	Tanzania
Integration with Policy Targets	• Does not have specific targets for total MW or total percentage of energy generated by renewable energy.
Eligibility	Eligible projects are restricted to be at least 100 kW and export no more than 10 MW.
Tariff Differentiation	• There is no differentiation based on technology, size, fuel type, or application. Tariff is differentiated depending on whether the SPP is grid-connected or mini-grid. • For 2012 Grid-Connected: Dry Season 183.05 TZS/kWh; Wet Season 137.29 TZS/kWh; Average 152.54 TZS/kWh • For 2012 Mini-Grid: 480.50 TZS/kWh
Payment Based On	Avoided cost (based on the long-run marginal cost)
Payment Duration	15 years
Payment Structure	A floor is set at the price in the year in which the contract was signed and a cap is set at 150% (adjusted in accordance with the Consumer Price Index) of the tariff price in the year in which the PPA was signed.
Cost Recovery	Because generators are paid tariffs that are below the marginal cost of new electricity procurements, there are arguably few or zero costs to recover.
Interconnection Guarantee	Eligible generators that meet technical requirements are guaranteed access to the grid. Maximum export capacity limited by voltage level at which connection is made.
Interconnection Costs	Generators must pay for the cost of interconnection.
Purchase and Dispatch Requirements	Guaranteed purchase if technical requirements are met.
Amount Purchased	100%
Purchasing Entity	Utility (TANESCO) and IPPs. RE generators can sell wholesale or retail.
Commodities Purchased	Electricity
Triggers & Adjustments	REFiT tariffs are recalculated every year based on the given years' budgeted avoided costs.
Contract Issues	Standardised contract (Power Purchase Agreement)
Payment Currency	Tanzanian Shilling (TZS)

prioritised hydropower by not providing differentiated tariffs and did not encourage investment in other renewable energy sources.

KEY AND UNIQUE FEATURES

Unlike most other countries, Tanzania uses an avoided cost methodology in setting the REFiT tariffs. One reason for this decision was the government's concern about the long time needed to develop a differentiated tariff payment system. It thus opted for a simple tariff system that allowed it to 'kick-start' renewable energy in Tanzania without further delays. Another important reason for the chosen approach was its cost-neutrality, given that no national or external funding was available to offset additional costs triggered by setting tariffs above TANESCO's avoided costs.

The current REFiT rate is thus based on mini-hydropower projects generating between 100kW and 10MW, which have a different LCOE from other technologies. As a result, the majority of projects currently under development and in the pipeline are mini-hydro. Many environmental groups see this as unsustainable given that Tanzania's water resources are already constrained due to the multi-year drought. The lack of technology-based payment differentiation is one of Tanzania's REFiT biggest weaknesses. Civil society organisations would like to see a technology-specific REFiT and are working with the government to determine a cost-recovery plan that will not over-burden the end-user.[8]

Another barrier for the implementation of more REFiT projects identified frequently by our interview partners were constraints with connecting new plants to the grid. While access to the grid is guaranteed in principle, a wide range of restrictions applies and SPPs bear all cost for the necessary technical adjustments.

8 Interviews with the government revealed a willingness to consider a technology-specific REFiT policy, but concerns about the costs of a new incentive structure remain.

EXTERNAL FACTORS

Solvency of state Utility

While the REFiT allows generators to sell directly to consumers, in most cases the off-taker is still TANESCO. Unfortunately, TANESCO has suffered from insolvency in the past due to its low bill collection rates[9] and retail electricity prices that do not reflect the high costs paid out for emergency generation to cover shortages.[10] This has a negative impact on the success of the REFiT policy as investors are wary of TANESCO solvency and are demanding higher payments to compensate for this risk. TANESCO's low creditworthiness is particularly problematic for smaller project developers and communities who typically have less liquidity and are therefore more vulnerable to delayed payments and risk.

Knowledge & Training

Interviews with stakeholders have highlighted their need for a clear 'proof of concept' before they begin whole-heartedly buying into the promise of renewable energy. A world bank-financed study tour taking Tanzanian regulators, ministry officials, utility engineers and potential project developers to learn from successful experiences in Thailand and Sri Lanka had proven a success in this regard. In particular, it led to the establishment of an 'SPP Cell' within TANESCO, which - supported by experts from these countries - helped to overcome much internal scepticism.

Local NGOs working on energy access have commented that some communities have been disappointed by failed solar PV projects in the past. In some cases, the imported solar PV equipment was sub-standard and did not perform to community expectations - despite

9 Prior to July 2012, TANESCO was collecting a monthly average of US$3.7 million from end-users. Monthly collections increased to US$5.4 million under new management. Mwita, July 27, 2012.

10 TANESCO has purchased emergency electricity from merchant generators at extremely high cost. Procurement from Songas accounts for 70% of TANESCO's expenditures - while only accounting for 15% of Tanzania's installed capacity and 28% of the country's total electricity consumption. The high cost is due to an outdated management contract signed during the liberalisation process. Ghanadan & Eberhard, March 2007.

diesel generators being widely viewed as unreliable and expensive.[11] There were additional issues with energy storage, and communities were unable to utilise the electricity generated in off-peak hours during times of high demand. The disappointment when the technology failed to address the communities' energy needs combined with high upfront costs has created a serious social acceptance risk.

Given these constraints, further confidence-building among stakeholders is needed. Successful demonstration projects and government-led feasibility studies have had a positive impact in other countries and could be replicated in Tanzania. To overcome the shortfall in local knowledge and expertise, capacity building programs are being implemented to provide training in equipment maintenance and repair. This approach provides local jobs and reduces operating and maintenance costs for residents. NGOs like GVEP International are also providing technology and business training certification schemes for rural energy enterprises in Tanzania. Both efforts promote acceptance of the REFiT policy through greater community participation and increased rural electrification.[12]

Historical Under-Development of Grid

Tanzania's grid is outdated and in need of repair and upgrading. However, there was no investment in the generation, transmission and distribution systems between 1996 and 2006, partly due to uncertainties caused by a debate about the privatisation of TANESCO. When it was finally decided that TANESCO would remain a state utility, the country already faced a considerable shortfall between installed capacity and domestic demand and little has been done since to address this problem.[13] This has a direct impact on the implementation of the REFiT policy, as concerns with grid stability will delay the connection of new power plants already in the pipeline. Moreover, such problems will discourage potential developers from investing in the REFiT in the first place. As a remedy for these obstacles, TANESCO should urgently consider implementing smart-grid technologies that are capable of incorporating renewables. In the meantime, off-grid or isolated mini-grid solutions should be prioritised to increase both energy production and access.

Access to Finance

The lack of long-term, low-interest financing has been a key challenge for SPP developers. Despite a US$23 million credit line provided to the Tanzanian Investment Bank (TIB) for eligible renewable/rural energy projects by the World Bank,[14] the loans from commercial banks to project developers continue to have high interest rates. Currently, interest rates are in the range of 12-15% and have short payback periods of only 7-10 years. Given the long lifetime cycles of power plants, these financing terms make investments in renewable energy unattractive and are especially prohibitive for smaller investors, such as communities and individuals.

IMPACTS

One of the drivers for Tanzania's REFiT policy was to improve access to reliable electricity for the country's on-grid and off-grid consumers. With a total of only 24.4 MW of newly developed capacity REFiT[15], the measurable impact of the REFiT has so far been minimal. However, there are an additional 60 projects of a combined 130 MW in the pipeline.[16] While most of the projects to date are on-grid developments serving urban environments, rural communities replacing their expensive diesel generators with cheaper renewable energy alternatives[17] arguably stand to benefit more in the medium term. However, such mini-grid solutions seem to take longer preparation time.

In addition to an overall increase of supply, improved grid stability and growing access to electricity, the REFiT also promotes local economic development, including by creating jobs in the renewable energy sector itself. Some national companies, such as Likungu Development, Katani Ltd. and Mkonge Energy Systems, have already joined the market to sell renewable energy equipment, develop generation projects, or construct installations.

OUTLOOK

Tanzania has successfully sought to minimise the transfer of costs to the ratepayer by utilising an avoided cost methodology. However, this has come at the expense of effectively promoting the full range of renewable energy technologies.

Many project developers believe that adding a differentiated tariff to the REFiT policy would increase the number of project applications and improve electrification. A technology differentiated tariff is also supported by civil society organisations, who hope that an improved 'return on investment' for under-developed technologies like solar and wind would diversify project development beyond mini-hydro. While the government has been open to the suggestion, a clear method for cost recovery that would minimise the burden on consumers has not yet been presented.

As regards investment security, the recent change of the TANESCO management, which is now working to improve governance and efficiency, is a positive development. In July 2012, TANESCO's new director announced a monthly surplus of over US$3 million and stated that government subsidies are no longer needed. If this trend continues, TANESCO is likely to regain its creditworthiness, which will encourage more investment in REFiT projects. Investor confidence in the new technologies will also be increased with the demonstrable success stories of more renewable energy projects coming online.

The REFiT's explicit support for mini-grid development is likely to improve access to clean energy in rural areas. Where renewable energies replace expensive fossil fuel generators, rural customers should benefit from a reduction in price. In comparison with urban areas, however, the prices will remain significantly higher[18] and thus remain one obstacle to rural economic development. This said, given the government's objective to integrate all mini-grids into the national grid, as well as its plan to offer newly connected users a choice between their previous tariff and the standard on-grid tariff, it will be increasingly difficult to justify differing price levels. In the medium term, this may call for a revision of the methodology used for calculating REFiT tariffs in favour equal consumer prices in urban and rural areas.

11 Ahlborg, H., Hammar, L., 2011.

12 This project is run in partnership with EAETDN, the Aga Khan Foundation's Coastal Rural Support Project, IT Power East Africa, Practical Action East Africa, and the government of Kenya.

13 Since the decision to maintain TANESCO as a public utility company, only 145 MW have been added to the grid, despite projections of increased electricity demand of 100-120 MW per annum.

14 The TIB has entered into a Financial Management agreement with the REA to administer this line of credit on behalf of the government. The current on-lending interest rate to local banks is 7.83%. Tanzania Investment Bank Limited, July 21, 2012.

15 The breakdown is as follows: 9 MW from the TPC Moshi Sugar co-generation; 1.4 MW from the Tanwat biomass project; 3 MW from the Mwenga hydro project; 1 MW from the Mafia Island biomass project; and 10 MW from the SAO Hill Energy biomass project. World Bank, 2011.

16 SIDA, August 31, 2012.

17 The generation costs per kWh for diesel generators was estimated at US$ 0.40 in 2011. In contrast, based on the applicable EWURA tariff for mini-grids, customers in off-grid areas are likely to pay only US$ 0.31 for renewable energies.

18 In 2011, urban on-grid customers paid US$ 0.18/kWh – about half the amount paid in rural areas.

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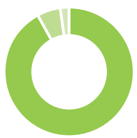
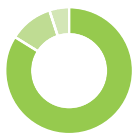
Uganda



Energy Mix

Total Primary Energy Supply[1]

- **Biomass = 92%**
- **Petroleum = 6%**
- **Electricity imports = 2%**



Electricity Generation Mix

Total installed electricity capacity (2012, MEMD): 619.5 MW[2]

- **Hydroelectric = 84.3%**
- **Thermal = 11.3%**
- **Biomass (bagasse) = 4.4%**

Electricity Stats

Electricity consumption per capita = 40kWh

Total electricity generation in the country in 2008 was 2,058 GWh, 71.3% of which came from renewable energy sources (including large-scale hydro).[3]

Electrification rate

National = 12%

Urban = 5.5%

1 (Reegle, 2012)

2 Ministry of Energy and Minerals Development, Annual Report 2012

3 (IRENA, 2012)

BACKGROUND & POLICY DRIVERS

When Uganda began exploring REFiT options in early 2006, only 5% of the population had grid access[1] and the majority of the population met their energy demands for cooking, heating, and rural industries through biomass.[2] Over 80% of Uganda's electricity is generated through hydropower, and - despite strong opposition triggered by social and environmental concerns[3] - large scale hydro projects are favoured by the government and multilateral development banks to meet the country's growing energy demand. This represents a worrying trend given the impact of climate change and recent droughts on water levels.

The Ugandan government began unbundling its energy and electricity sectors in 1999 to comply with the terms set by the World Bank/IMF in order to be eligible for debt forgiveness. The Electricity Act of 1999 allowed for independent power production (IPP) as well as creating the independent Electricity Regulatory Authority (ERA), and the Rural Electrification Fund (REF), which is funded by a 5% levy on all bulk electricity sales[4]. However, this failed to tackle the historical under-development of Uganda's energy sector. In 2005, low water levels in Lake Victoria almost halved effective generation to less than 200 MW, and combined with growing domestic electricity demand, led to rolling blackouts and the purchase of expensive emergency diesel and heavy fuel generators. The cost was around $740 million between 2006-2008 if consumer subsidies are included, and while intended to be temporary, is ongoing.[5]

Despite civil society calls for renewable energy dating back to 1997, it was not until the 2005 energy crisis that the government began to listen. But even then it only invited private sector developers to the consultations, centring on large hydro projects. Many civil society actors felt that their push to have a more balanced energy solution, promoting a decentralized approach and small-scale technologies that could foster greater access and reduce rural poverty, resulted in them being marginalized in future negotiations.

Uganda's the first attempt at a REFiT, covering only bagasse cogeneration and hydropower, was implemented in 2007 and met with limited success. To begin with, the necessary technical capacity was not readily in the country. Investors complained that the offered tariff, calculated on avoided rather than generation costs, provided insufficient returns to cover all costs (importation of technology, transportation, technical expertise). Finally, due to recent defaults on payments the state utility purchasing the electricity, Umeme, was perceived as not creditworthy.

Consultations with stakeholders led to a revision of the policy, increasing tariffs and basing the calculation on the cost of generation. However, while organizations such as the Uganda Renewable Energy Association and Solar Energy for Africa both had prominent voices in the formulation of the REFiT, the process remained focussed on potential investors and many CSOs felt that they and their concerns were excluded from the process.

1 Less than 2% of the population in rural areas had grid access.

2 Ministry of Energy and Mineral Development, 2002. Biomass constituted over 90% of total energy consumption in the country.

3 See for example "The Unresolved Issues in the Bujagali Dam Project in Uganda", National Association of Professional Environmentalists, 2007

4 In addition to parliamentary appropriations, this money is used to subsidize 100% of the cost of transformer installation and 15% of the cost of a new connection up to 1 km from the grid. Their work allows a rural household to connect to a mini-grid at a reduced rate of approximately US$25/connection.

5 International Network for Sustainable Energy, 2011

FIT Design Features	Uganda

Integration with Policy Targets	• Renewable Energy Policy (REP) aims to increase the use of new renewable energy from the current 4% to 61% of total energy consumption by 2017.
	• By 2017, the governments wants total installed capacity (by technology):
	  • Large hydropower 1200 MW
	  • Mini and micro hydropower 85 MW
	  • Cogeneration 60 MW
	  • Geothermal 45 MW
	  • Municipal waste 30 MvW

Eligibility	Eligible projects must be between 0.5-20 MW. Projects above the maximum cap can be negotiated on a case-by-case basis
Tariff Differentiation	Wind (<150 MW) 0.124 US$ Solar PV (<7.5MW) 0.362 US$ Geothermal (<75 MW) 0.077 US$ Landfill gas (<50 MW) 0.089 US$ Biogas (<50MW) 0.115 US$ Biomass (<50MW) 0.103 US$ Bagasse (<100 MW) 0.081 US$ Hydro (500 kW -1MW) 0.109 US$ Hydro (1MW-8MW) Linear interpolation Hydro (>9MW) 0.073 US$
Payment Based On	Cost of generation
Payment Duration	20 years
Payment Structure	Tariff is a fixed payment with inflation adjustments.
Cost Recovery	REFiT policy costs are recovered from ratepayers. The policy also allows the costs to be shared through voluntary green power program revenues, donor support, international climate change funds, and/or other climate finance mechanisms.
Interconnection Guarantee	Guaranteed for licensed generators within system grid. For generators beyond the national grid, access and connection is subject to future power demand requirements.
Purchase and Dispatch Requirements	System operator required to purchase 100% of RE generated electricity independent of power demand. System operators must discharge and transmit to licensed generators; however, they can dictate dispatch instructions under emergency conditions.
Amount Purchased	100%
Purchasing Entity	Uganda Electricity Transmission Company
Triggers & Adjustments	Technology-specific capacity thresholds Review process- every 2 years during the first 4 years, then every 3 years Degression- can be applied after the first 4 years. Transparent schedule of annual reductions.
Contract Issues	Standard contract
Payment Currency	US$

KEY AND UNIQUE FEATURES

Priority Technologies

Uganda's REFiT system is unique in it that – in addition to tariff differentiation - it prioritizes certain technologies in the application process. Annual caps for newly installed capacity apply to all technologies, but the more expensive technologies of the second priority tier (currently only solar PV) have a lower annual limit. While priority one projects are simply accepted on a first come, first serve basis; applications for priority two projects are chosen through a more difficult competitive process (one of the selection criteria being the project's impact level of local economic development and employment creation).

Front-loaded Tariffs

Despite switching from avoided-cost to cost-generation, the current tariffs remain too low for many investors. PPAs signed up to now have been negotiated outside the REFiT framework by industrialists and manufacturers such as the Kakira Sugar Works. Their primary concern has been securing their own supply of electricity, with feeding-in to the grid coming a hesitant second due to low tariffs and high costs. To make the tariffs more attractive, the government is considering 'front loading' payments for the first five years and then dropping to a lower level thereafter. This would allow debtors to be paid off more quickly and reduce some of the financial burden. However, while welcomed by developers, this system has not yet been introduced.

External Financing

Uganda's REFiT also allows for innovative financing schemes, including international climate change funds, donor support, and a voluntary green power program (For more on REFiT Financing, See Chapter 7). Although none of these schemes have been operationalized to date[6], it is worth noting Uganda's commitment to innovation and creative financing of its REFiT policy.

6 Deutsche Bank's GET-FiT programme has just established a pilot in Uganda, supported by the World Bank and the German Development Bank, KfW. As yet no projects have been commissioned. Government of Uganda, Electricity Regulatory Authority, 2012

EXTERNAL FACTORS

Real and Perceived Investment Risks

Many actors in the private sector have struggled with properly assessing both real and perceived technology-specific investment risks. This has led to hesitation as investors are unsure of the viability of renewable energy in Uganda. In some cases, this stems from a general lack of awareness and understanding of renewable energy technologies among all stakeholders. Developers have also complained lengthy bureaucratic processes taking as long as four years to secure a license. Also, the annual limit for newly installed capacity leads to uncertainty whether a project will receive funding or not.

Off-taker creditworthiness

Umeme has sole responsibility for distribution and is also the single buyer of electricity under the REFiT. Once a project has been approved under the REFiT, the utility is obliged to purchase all generated capacity. However, due to repeated defaults and late payments Umeme is not viewed as creditworthy, which increases the risk and therefore the overall investment cost.

Access to Finance

Uganda's REFiT encourages small-scale generation, but local developers lack the necessary access to capital and technical experience to develop projects. As with many East African countries, high interest rates (12% to 15%) and short repayment periods of 7 to 10 years make financing small- to medium-sized projects difficult. A number of bilateral (Norway) and multilateral donors (World Bank) are actively trying to improve access to finance by providing low-interest loans. A second approach is to attract larger Investors by bundling several smaller projects into larger packages. However, given the lack of projects built under the REFiT, investors may still feel there is insufficient proof of concept and thus shy away from perceived risks.

Connection uncertainty

Interview partners also identified concerns around the interconnection guarantee. Both the developer and utility share responsibility for the grid-connection, but there remains confusion over the details. This exposes both parties (and therefore the rate-payer via the utility) to potentially unexpected costs and increased risk.

IMPACT

The existing renewable energy plants with a capacity of 315 MW[7] are all based on contracts negotiated directly between producers and the state utility. While no projects under the REFiT framework have yet come online, there are currently 200 MW of REFiT projects in the pipeline.[8] However, given that the policy sets the minimum plant size at 0.5 MW, is not likely to foster greater involvement of communities or households in electricity generation.

OUTLOOK

The government of Uganda will need to address the serious issues affecting its REFiT if it wants to meet its renewable energy and economic development goals. It is currently going through a third revision of its policy in an attempt to generate interest and is considering introducing a premium tariff for some technologies for a limited period to attract investors who are in a position to implement projects in a short time-frame.[9] Uganda also appears keen to operationalize climate finance or donor funding in order to minimize the burden on the ratepayer.

The Rural Electrification Fund has been the main driver of energy access provision, and while it has had many successes, it requires additional policy tools and full integration with the REFiT (enabling community and civil society participation) to accelerate the pace and deliver the policy's desired socio-economic benefits. There are concerns that integrating rural expansion into the REFIT may lead to a cost explosion for rate payers. This argument notwithstanding, RE technologies are already producing electricity at lower costs than the diesel generator prevalent in many off-grid areas. A policy supporting renewable energies in off-grid environments might be considered as a complement to the existing REFiT policy to help Uganda achieve its policy aims in both urban and rural areas (see chapter V and VI).

7 This is comprised of large scale and mini-hydro, as well as some cogeneration. The government's aim is a production capacity of 1,420 MW from renewable energies by 2017.

8 The ERA currently has 4 applications for solar projects, 4 applications for waste energy, 10 applications for mini-hydro, 3 applications for bagasse cogeneration, 1 application for wind, and 1 application for biomass.

9 In January 2013, ERA Chief Executive Officer Benon Mutambi announced an increase of tariffs by 5-24% (depending on technology and plant size). Daily Monitor: Govt to increase feed-in tariffs, 6 January 2013.

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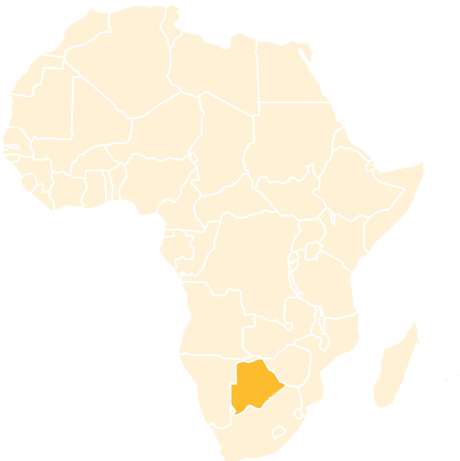
CHAPTER

IV

REFiT POLICIES IN THE MAKING

Botswana



Energy Mix

Source: International Renewable Energy Agency, 2012

- **Oil & Oil products =** 48%
- **Biomass =** 27%
- **Coal & Coal Products =** 25%
- **Solar =** 0.01%

Electricity Generation Mix

Total installed capacity 132 MW

- **Thermal (Mainly coal) 132 MW =** 100%

The rest of its electricity is imported from South Africa (approx. 80% of its electricity is imported)

Electricity Stats

Electricity production per capita = 21 kWh

Electricity consumption per capita = 1802 kWh

Electrification Rate

Urban = 56% **Rural =** 44%

Policy Details

Enabling Legislation	The Electricity Supply Act of 1973 was amended in 2007 to facilitate the operation of Independent Power Producers (IPPs), laying the groundwork for a FiT program.
Adopted	March, 2012
Implemented	TBD
Existing Programs & Policies to Support Renewable Energy	Botswana's Tenth National Development Plan (NDP 10) aims to have renewable sources supply 15% of electricity generation by 2015 and 30% by 2030.

POLICY DETAILS

Botswana's heavy dependence on energy imports has contributed to the government's increasing interest in promoting renewable energy. The country's current demand of 400 MW is met largely by electricity imported from the South African utility Eskom, which supplies 72% of Botswana's energy needs.[1] In 2010, the Government of Botswana (GoB) Department of Energy Affairs commissioned a study on renewable energy feed-in tariffs, which identified significant potential for generating power from biomass, biogas (including landfill gas), CSP, and solar PV.[2] The launch of a REFIT program appears to have been delayed[3] and few details about the policy have so far been announced. However, Botswana's National Development Plan (2009-2016) clearly outlines the country's commitment to improved energy access through increased availability and supply of electricity. Given the planned structure of Botswana's REFIT (see table), and its inclusion of small-scale generation, the policy could positively impact decentralized generation and community participation in Botswana.

There have been several reasons for delays in policy implementation. First, the government is concerned that renewable electricity will increase the cost of electricity for its citizens - the current retail price for electricity is US$0.048/kWh plus a monthly service fee of US$1.33. Second, the government is also concerned that much of the technology will need to be imported, thus impacting the country's balance of payments. Third and finally, there is a mismatch between the types of projects that the Government of Botswana wants to see developed and the projects that developers are currently eyeing. Some project developers have expressed interest in building large projects that exceed domestic demand, whereas the government has emphasized its desire to build grid capacity through multiple small projects. The government is concerned that if one large installation goes 'offline' it will impact the entire grid and electricity supply, so it is trying to diversify its source through small installations.

1 Reuters, 2011

2 Botswana has such a significant biomass and biogas potential because of its successful beef and cattle industry. Botswana is one of the largest exporters of beef to the European Union (Republic of Botswana, 2012)

3 In early 2011, an official of the Ministry of Minerals, Energy and Water Resources Benoni Erskine expected a final report to be released in November 2011 with implementation of REFiT by March 2012. In May 2012, PV Tech reported that the REFiT was scheduled to be introduced in June. Reuters, 2011; Choudhury, N., 2012

FIT Design Features	Botswana
Integration with Policy Targets	15% of electricity generation by 2015 and 30% by 2030
Eligibility	IPP projects up to 5MW are eligible; projects >5MW will enter into PPAs with the state-owned utility, Botswana Power Corporation
Contract Issues	FIT for ≤ 5MW; PPA for >5MW

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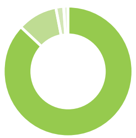
Reuters (March 30, 2011). Botswana sees renewable feed-in tariffs for 2012. Available at: http://af.reuters.com/article/investingNews/idAFJOE72T0JC20110330

Egypt

Energy Mix

Source: International Renewable Energy Agency, 2012

- **Natural Gas** = 50%
- **Oil & Oil products** = 45%
- **Biomass** = 2%
- **Hydro** = 2%
- **Coal & Coal Products** = 1%
- **Wind** = 0.1%



Electricity Stats

Power plant installed capacity (2011)[1]
Total: 27,130 MW

- **Thermal (oil, gas)** 23,760 MW = 87%
- **Hydro (large)** 2,800 MW = 10%
- **Wind 550 MW**= 2%
- **Concentrated Solar Power 20 MW** = 0.07%

1 New & Renewable Energy Authority, 2011: p. 12

Electricity Stats

Consumption per capita (2009)[2] = 1,548.6KWh

Electrification Rate (2009)[3]

National = 99.6%

2 United Nations, 2012
3 OECD, IEA, 2011

BACKGROUND & POLICY DRIVERS

Egypt already has some successes with the uptake of renewable power projects, although its grid mix is still dominated by thermal energy (petroleum and natural gas). In addition, the country has a relatively large installed capacity of off-grid power (234 MW), of which more than 95% is diesel or natural gas fuelled.[1] However, availability of natural gas for power cannot keep up with the rapidly growing electricity demand (7.5% per annum from 2005-2010), which already led to summer load shedding and an increased use of expensive and inefficient heavy fuel oil for electricity generation.[2]

To address the high dependence on fossil fuels and the electricity shortages, the Egyptian government is looking to increase the generation capacity from renewable energies. In February 2008, the Supreme Energy Council adopted a resolution targeting the contribution of renewable energy generated electricity to reach 20% of total energy generated by 2020. This is expected to come predominantly from wind (12%, approximately 7200 MW), hydro (5.8%) and solar (2.2%, CSP and PV). Land for the wind programme has already been set aside.[3] [4]

As of June 2011, the country had 545 MW of grid-connected wind farms installed – the largest capacity in all of Africa and the Middle East, as well as a 5.2 MW wind demonstration facility connected to an isolated grid. In 2011, a 140 MW solar thermal combined cycle power plant (20 MW solar capacity, 3.6% of plant generation[5]) came online, the first in Africa.[6]

The New and Renewable Energy Authority (NREA) is the government department leading the REFiT development and is mainly supported by the German international development agency, GIZ. Although there are a number of civil society organizations working in the renewable energy and energy efficiency space, none of the interview partners have acknowledged consultations with this sector to date.

The target for wind energy is planned to be met by a combination of state-owned projects implemented by NREA (2,375 MW) and private sector projects (4,835 MW), with a two-phased approach: (1) a competitive bidding process and (2) a Feed-in Tariff.[7]

1. NREA has begun a competitive bidding process for the tender of new renewable energy projects. In this process, IPP operators for predetermined sites in the Gulf of Suez and East and West River Nile will be selected to sell electricity directly to the Egyptian Electricity Transmission Company (EETC) under a PPA for a term of 20-25 years.[8] The Central Bank of Egypt backs the electricity buyer (EETC)'s ability to pay, which is in effect a sovereign guarantee and provides more security for investors. In May 2009, the first short-list of investors submitted their development plans. Competitive tenders for wind projects will be launched regularly until 2017 to achieve the 2020 energy target.[9]
2. In the future, the government is considering putting into place a Feed-in Tariff, based on the experience gained in the competitive bidding process.[10] However, indications of a possible REFiT have been in the pipeline for more than five years, with no draft yet written. There is no indication on what tariff levels might be offered, although it is predicted to cover wind, solar and potentially biomass.

1 Egyptian Electricity Holding, 2011: pp. 16-27.
2 Razavi, H. et al., 2012: pp. 13, 18.
3 Egyptian Electricity Holding, 2011: p. 29.
4 New and Renewable Energy Authority, 2012.
5 Although solar is around 14% of the total plant capacity, its capacity factor is around 20%, compared to 90% for natural gas, meaning it only contributes 3.6% of the total electricity output.
6 Egyptian Electricity Holding, 2011: pp. 15, 28. ; Egyptian Electric Utility & Consumer protection Regulatory Agency, 2012.

7 New & Renewable Energy Authority, 2012.
8 Government of Egypt, 2009: pp. 27-30.
9 MENA-OECD Energy Task Force, 2011.
10 Egyptian German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection, undated.

This approach has likely been taken since Egypt already has experience in competitive bidding in the thermal power sector and can build on this for renewable energy, before taking lessons learned from the bidding process and applying it to a REFiT. Another reason may be that Egypt has historically been focused on large (50 MW+) power projects and the REFiT may possibly be designed for smaller and medium-size generators (see below), which are not prioritized in the state power sector planning.

BARRIERS

Indications of a possible REFiT have been in the pipeline for more than five years and it has been noted that one reason for the already long delay towards a REFiT policy is the lack of real government support. While NREA supports the policy, one interviewee noted that other government institutions, fearing that this could undermine the state's current control of the power sector, did not.

Subsidies for dirty energy are an important obstacle. While generation costs in 2008/2009 were approximately USD 0.035 – 0.045/kWh[11], the tariff for electricity producers in 2007 was as low as USD 0.022/kWh, making renewable energy projects unfeasible. Nine out of ten residential consumers pay less than 50% of the costs of generation, setting the price of electricity in Egypt among the lowest in the world.[12] However, the draft for a new electricity law wants to force the electricity sector to operate on an economic basis. Current subsidies (cheap petroleum and government financial guarantees) to state operators would be reduced or removed and used to support low-income consumers.[13] This may provide more room for renewable energy generators to operate under a Feed-in Tariff system.

Some commentators believe that the regulatory framework is not yet conducive for a REFIT, citing a lack of technology-specific tariffs and continued government dominance of the electricity sector. Land issues are seen as another key area to be addressed. If scarce agricultural land is taken up by renewable energy projects, this could exacerbate existing conflicts. The competition for land may force projects into desert areas, but the extra cost to connect to the grid will limit participation to larger players. Desertec, a multi-billion euro project to connect the Middle East and North Africa (MENA) renewable resources to Europe, is one such plan, backed by large European multinational corporations.

OUTLOOK

Stakeholders in Egypt believe that it will still take 2-3 years before a REFiT policy is established. However, most commentators agree that there are enough interested local investors and technical capacity in Egypt to build and operate renewable energy power plants under a REFiT and significant domestic benefits such as technology development, industrialization, and job creation can be expected.

In the short term, it seems that larger, well-established Egyptian or foreign companies, or those with access to land, will become the first producers of renewable energy under a REFiT. It remains uncertain whether a Feed-in Tariff mechanism would provide incentives for locally owned mini-grids. According to a civil society expert, farmers lack the technical and financial expertise to take advantage of the policy. Awareness raising on renewable energy and training on how to develop projects would be required before rural communities would be able to benefit as suppliers of electricity.

The changing political landscape in Egypt could also affect the success of the REFiT policy, which was developed under the former President Mubarak. The new government, currently focussed on other priorities, has not yet made any clear statements regarding support for renewable energy and Feed-in-Tariffs. Nevertheless, this could be an opportunity for increased public participation in REFiT decision making.

11 Ibid.

12 Fujiwara, N., Alessi, M., Georgiev, A., 2012: p. 8.

13 Mansour, N., 2010.

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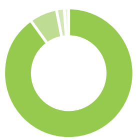
Ethiopia

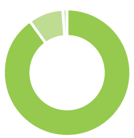


Energy Mix

Source: International Renewable Energy Agency, 2012

- Biomass = 92%
- Oil & Oil products = 7%
- Hydro = 1%
- Geothermal = 0.04%

Total = 1,368.2 petajoul



Electricity Generation Mix

Power plant installed capacity 2,024.5 MW

- Large hydro 1,842.6 MW = 91%
- Thermal 174.6 MW = 8,6%
- Geothermal 7.3 MW = 0,4%

Electricity Stats

Electricity consumption per capita = 45.8 kWh

Electrification Rate

Urban = 80% Rural = 2%

BACKGROUND & POLICY DRIVERS

With an electrification rate of approximately 20% in 2010, a population growth rate of 2.6% and an average of 200,000 new households being connected to the national electricity grid each year, the demand for electricity – far from being met today – will rise significantly. In line with its goals for economic development, the Ethiopian government plans to increase electricity generation five-fold by 2016 – from the current 2,000 MW to 10,000 MW – and to reach an electrification rate of 75% through grid expansion. The government aims to generate a significant energy surplus, which will be exported to Djibouti (150 MW), Kenya (500-1000 MW) and Sudan/Egypt (up to 3,400 MW from 2018).[1] Most of the capacity for export will be provided by large hydropower dams, which are currently under planning and construction.[2] However, NGO representatives believe that while current government plans may deliver revenues from exported energy, they will not meet domestic electricity needs, in particular in rural areas.

Ethiopia has to date followed a centralised and state-controlled electrification strategy, which is almost exclusively based on large hydropower projects. In 2009 and 2010 more than 1,000 MW of capacity was installed with donor support. Apart from large hydro, the country's first large wind farm became operational in 2012 and more are in the pipeline.[3] Moreover, a revitalisation and expansion of Ethiopia's geothermal resources is planned.[4] None of the mentioned projects are expected to have private sector ownership.

In October 2009, the Ethiopia Government started drafting a Feed-in Tariff law. The REFiT proclamation is accompanied by two other instruments: an Energy Proclamation and REFiT operational regulations. However, little progress has since been made on these instruments[5] or the law itself, with a fifth draft version still under discussion in early 2013.

ORIGINS OF THE REFIT LAW

In Ethiopia's case, the REFiT policy was first initiated and promoted by the German GIZ and the World Bank. The Ethiopian Electricity Agency (EEA) then became the lead government agency in the REFiT process and developed the first drafts internally using examples from different countries around the world. However, the early versions of the REFiT policy were not well-prepared and required further revision with development partner support over a drawn-out period. While a stakeholder consultation on the draft took place in 2010, involving both NGOs and the private sector, many of the comments made were not adopted. The inclusion of solar PV in the most recent REFiT draft is one notable exception.

At times the REFiT policy seemed to be taking a set backwards – initially accepted provisions were changed without explanation in subsequent drafts. This erratic approach has been criticised by at least one commentator for not instilling outside parties with confidence in the soundness of the draft REFiT proclamation. Furthermore, all national energy-related decisions have been centralised within the Prime Minister's Office, which has limited the ability of EEA and the Ministry to act independently.

BARRIERS

The REFiT policy is mainly designed to increase electricity supply with the help of non-state actors. However, to date there is no non-state (private sector, civil society, etc.) or local government participation in the on-grid electricity sector in Ethiopia, even though non-state power producers have been

1 Federal Democratic Republic of Ethiopia, 2011: p. 89.

2 E.g. Gibe III at 1,870 MW, Hallele Warabessa at 436 MW and Karadobi at 1,600 MW.

3 Such as Ashegoda – 120 MW, Adama I – 51 MW and Assela.

4 Federal Democratic Republic of Ethiopia, 2012: p. vii.

5 The documents are not publicly available and as such it was not possible to assess their relevance for Ethiopia's REFIT

permitted by law for more than a decade.[6] Even small renewable energy projects are exclusively owned by the Ethiopian Electric Power Corporation (EEPCo). Private and civil society experience has so far been restricted to small-scale off-grid solutions in the residential or agricultural sector, such as solar PV for solar water pumps. This also means that there is a general lack of experience in negotiating PPAs, on the sides of both the private sector and the government authorities.

While civil society organisations and small investors are in principle eligible to become suppliers of electricity under the REFiT, both the envisaged tariffs and administrative procedures seem to be strongly in favour of large-scale investors. The tariffs initially announced have also been strongly criticised as being too low to allow a profitable investment in renewable energy production. It has been suggested that the latest decision to revise the draft law once again, announced by the government in October 2012, could lead to higher tariffs and increased private sector interest.[7] But even if that were the case, funding barriers would remain for Ethiopian companies to participate in the renewable energy sector - including high bank interest rates, short loan tenors and substantial collateral requirements. The Rural Electrification Fund, which supports relatively small power plants with capacities of 100 kW to 5 MW for educational and healthcare centres and is open to renewable technologies, could help to alleviate this. However, to date the fund has mostly subsidised diesel power generation.[8] Furthermore, given the substantial initial investment costs for renewable power plants, the amount of financing available under the Fund (initially set at EUR 29 million) would need to be significantly increased to allow the support of a larger number of renewable energy projects. Nevertheless, the Fund gives an idea of the type of useful support mechanism that can complement REFiTs.

OUTLOOK

The drawn-out process in parliament is indicative of the lack of real government backing for a REFiT and a lack of understanding for the different REFiT design options and their implications. Furthermore, the REFiT has so far been developed in isolation of other government policies, which may have negative consequences on its eventual performance. For example, while solar PV has been added to the eligible technologies, high taxes are levied on the necessary equipment. In its current form, Ethiopia's REFiT is likely to benefit big investors developing large-scale projects.

While some stakeholders have argued that an imperfect REFiT may be better than none at all, recent experience with hastily passed laws in Ethiopia suggests that more time should be spent on involving stakeholders in the design phase instead of painfully learning from bad experiences during implementation. In any case, the death of the Ethiopian Prime Minister in August 2012 and the subsequent realignment of government responsibilities is likely to further delay the approval and implementation of the REFiT. Commentators believe that the policy will be stuck in limbo in the short term as policy reforms are slowed down or deferred, but that in 2-3 years it could begin again, with support for the REFiT increasing. The intervening time should be used to further improve the REFiT and work towards removing potential barriers such as import taxes on renewable technologies, access to finance and lengthy administrative procedures.

6 Federal Democratic Republic of Ethiopia, 1997.
7 Addis Fortune, 24 October 2012.
8 Power, M. et al., 2009: p. 18.

Table 1. Ethiopia REFIT Design

FIT Design Features	Ethiopia				
Eligibility	• Only main-grid connected projects • Projects with less than 50% government ownership • Hydropower (0.1 – 10 MW) • Biomass (0 – 10 MW) • Geothermal (0.5 – 10 MW) • Bagasse (0.1 – 10 MW) • Wind (0.2 – 10 MW) • Solar PV				
Tariff Differentiation	**Technology**	**Capacity (MW)**	**Firm Energy (USD/kWh)**	**Non-Firm Energy (USD/kWh)**	**All Energy (USD/kWh)**
	Hydropower	0.1 – 0.5 0.5 – 2.5 2.5 – 5.0 5.0 – 10	0.080 0.075 0.070 0.065	0.060 0.055 0.050 0.045	
	Biomass	0.0 – 0.5 0.5 – 2.5 2.5 – 5.0 5.0 – 10	0.100 0.095 0.090 0.085	0.080 0.075 0.070 0.065	
	Geothermal	0.5 – 2.5 2.5 – 5.0 5.0 – 10	0.100 0.095 0.090	0.080 0.075 0.070	
	Bagasse	0.1 – 0.5 0.5 – 2.5 2.5 – 5.0 5.0 – 10			0.100 0.090 0.080 0.070
			Wind speed <7.5m/s	Wind speed ≥7.5m/s	
	Wind	0.1 – 0.5 0.5 – 2.5 2.5 – 5.0 5.0 – 10	0.100 0.090 0.080 0.070	0.090 0.080 0.070 0.060	
Payment Duration	15 years for wind, biomass and bagasse; 20 years for hydropower and geothermal				
Payment Structure	A floor is set at the price in the year in which the contract was signed and a cap is set at 150% (adjusted in accordance with the Consumer Price Index) of the tariff price in the year in which the PPA was signed.				
Interconnection Guarantee	Power distribution utilities and bulk electricity consumers are obligated to purchase a certain percentage of their energy requirement from RE.				
Interconnection Costs	The system operator is responsible for costs of up to 25km of transmission lines. The costs can be recovered from consumers.				
Contract Issues	Standardised contract (Power Purchase Agreement)				
Payment Currency	Ethiopian Birr				

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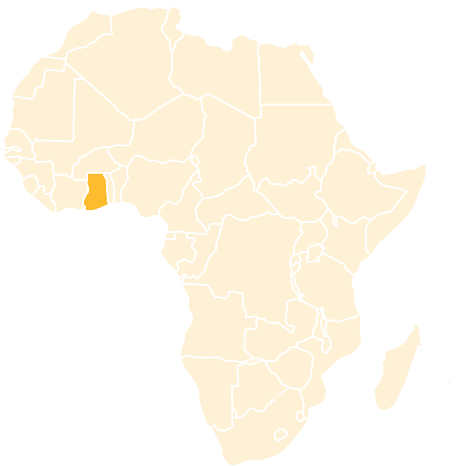
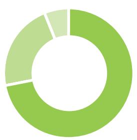
Ghana





Energy Mix

Source: International Renewable Energy Agency, 2012

- **Biomass** = 72%
- **Crude Oil** = 22%
- **Hydro** = 6%

Electricity Generation Mix

Total installed capacity 2056 MW

- **Hydroelectric 1180 MW** = 57%
- **Thermal Generation 876 MW** = 43%

Electricity Stats

Electricity production per capita = 33 kWh

Electricity consumption per capita = 129 kWh

Electrification Rate

Urban = 78% **Rural** = 23%

Policy Details

Enabling Legislation	**Renewable Energy Act of 2011 (Act 832)**
Adopted	December 2011
Implemented	Planned for June 2013
Existing Programs & Policies to Support Renewable Energy	World Bank-funded Ghana Energy Development Access Projects (GEDAP) provides up to a 50% partial capital subsidy for renewable power systems. Ghana has an existing import duty waiver/tax deduction for renewable energy systems. Any interaction between the planned FIT and these programs has not yet been identified.

BACKGROUND & POLICY DRIVERS

Ghana's feed-in tariff program was adopted via the 2011 Renewable Energy Act (Act 832), which seeks to increase energy from modern renewable technologies from 0.01 percent of current electricity generation to over 10 percent by 2020. In addition to implementing a feed-in tariff, the Act also created the 'Green Fund' to finance various energy-related measures, such as the implementation of a social transfer mechanism, provision of incentives for domestic production, and facilitation of effective grid integration.[1] Details on the social transfer mechanism have not yet been provided, but such systems usually include mechanisms to help distribute the costs of the REFIT and ensure they are borne fairly according to energy usage, emissions, or ability to pay.

The Ghanaian government wants to demonstrate the country's commitment to climate change mitigation. Act 832 codifies the target of 10-20% renewable energy by 2020 as expressed in Ghana's Nationally Appropriate Mitigation Actions (NAMAs), submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in February 2010.[2] The Act also builds on Ghana's ongoing efforts since 1990 to electrify all communities with more than 50 inhabitants and achieve universal energy access by 2020[3]. However, this has yet to translate to significant job creation and economic benefits, areas where Ghana hopes renewable energy deployment will bring increased returns.[4]

With a predicted growth in demand reaching as much as 5000MW by 2015[5], the erratic supply and outages being experienced are only set to worsen. Thus, the government also seeks to expand overall electricity generation beyond the current 2056MW. Ghana aims at renewable energy supplying at least 10% (500MW) of total demand by 2015, with a World Bank-funded study identifying potential from wind (200-300MW), small hydro (150MW), biomass (90MW) and solar PV (20MW).[6]

The Government, with advice from the World Bank, expects to meet remaining growth in demand through increasing hydroelectric power, although many civil society groups are concerned such an approach will cause greater social and environmental damages and not lead to greater security of the energy supply.[7]

ORIGINS OF THE REFIT LAW

The REFIT law arose from Government recognition that a lack of incentives and a clear regulatory framework were preventing developers and investors from committing to

1 Neidlein, H., 2012

2 Republic of Ghana, Ministry of Environment Science & Technology, 2010

3 Ahiataku-Togobo, W., 2012

4 Oteng-Adjei, J., 2012

5 Ahiataku-Togobo, W., 2012

6 Ahiataku-Togobo, W., n.d.

7 Daily Graphic, 2012

renewable energy.[8] In addition, the government wants to demonstrate the country's commitment to climate change mitigation.[9]

After two years of extensive analysis and stakeholder meetings involving the government, power producers, and project developers[10] - although not civil society - the REFiT emerged as a key policy instrument and was adopted as part of the 2011 Renewable Energy Act.

In a separate process, government, utilities, project developers and financial institutions with the support of the World Bank, discussed the technical aspect of a REFiT policy.

Again, civil society and representatives of the energy poor were excluded, undermining the government's intention to use the REFiT to tackle energy poverty. In general there has been very little transparency, with very little information on the REFIT design (see table) being made public. This also applies to the implementation timeline. The date originally slated for the launch of the REFIT, early June 2012, came and went with no indication of the program's status or a new time frame.

BARRIERS

Financing the REFIT may be one of the key challenges responsible for the delayed policy implementation. Although Ghana hopes to use the REFIT to attract more than USD $1 billion in private sector investment in the national electricity grid in the next coming years, it is not yet clear how the cost of the REFIT program itself will be financed. Ghana's Minister of Energy Dr. Jo Otenj-Adjei has been seeking funding from the international community, most recently at the European Union's Sustainable Energy Summit in Brussels where he spoke about the country's progress and its need for international support for the Renewable Energy Fund. European colleagues have made pledges but conditionality clauses are often problematic.[11] Ghana also hoped to attract international financing through the NAMA projects submitted, but to date these efforts have not been successful. Wisdom Ahiataku-Togobo, Director of Renewable Energy at the Ministry of Energy, has also cited insufficiently favourable regulatory and fiscal regimes as significant barriers to attracting private sector investment.[12]

OUTLOOK

Ghana's Renewable Energy Act is unique among African countries, in that it specifies the need for a social transfer mechanism. As stated earlier, the details of how this mechanism would operate and be implemented are still unknown—nevertheless, Ghana deserves credit and recognition for codifying the need to fairly distribute the costs of a REFIT.

The government of Ghana has high aspirations for its REFIT policy. While the REFIT has yet to be launched, it is hoped that the program will have positive impacts on job creation, improved health, and reduced environmental degradation. It remains unclear to what extent the government will use the REFIT to support access to electricity beyond its existing programme of grid extension. However, other government programmes as well as civil society organizations and small and medium enterprises play an important role in providing the off-grid community with increased access to electricity from renewables.

Repeated delays in policy implementation, particularly due to financing concerns, run the risk of discouraging investors from participating in the REFIT if it seems that government will be unable to keep to the long-term contracts. Wisdom Ahiataku-Togobo has indicated that Ghana aims to invest revenue from its fossil fuel exports into upgrading and building additional renewable energy infrastructure. This approach could reduce investor uncertainty and could also be used to fund or co-fund the REFIT, similar to the petroleum levy implemented by Algeria.

8 Revolve, 2012
9 Ahiataku-Togobo, W., 2012
10 PriceWaterhouseCoopers, 2009

11 Revolve 2012.
12 Ahiataku-Togobo n.d.

Table 1. Ghana REFiT Design

FIT Design Features	Ghana
Integration with Policy Targets	• Target of 10% renewable energy by 2020 (approximately 50MW) at a targeted generation capacity of 500MW, or 75% if large-scale hydro power is included. However, the Ministry of Energy has indicated this goal may be increased due to the scale and number of projects in the implementation pipeline. • Goal to increase use of RE in remote and poor regions (Ahiataku-Togobo n.d.)
Tariff Differentiation	Technology-differentiated
Payment Based On	Cost of generation
Cost Recovery	Establishment of a RE Fund, but fund financing is yet to be determined. Fund could include private or international donor funds or a levy on energy-intensive industries, fossil fuel companies, or utilities.
Purchase and Dispatch Requirements	Power distribution utilities and bulk electricity consumers are obligated to purchase a certain percentage of their energy requirement from RE.
Purchasing Entity	Off-taker can include the Electric Company of Ghana or other bulk customers.
Triggers & Adjustments	Tariff fixed for 10 years, subject to review every 2 years thereafter
Contract Issues	MOU between IPP and Off-taker

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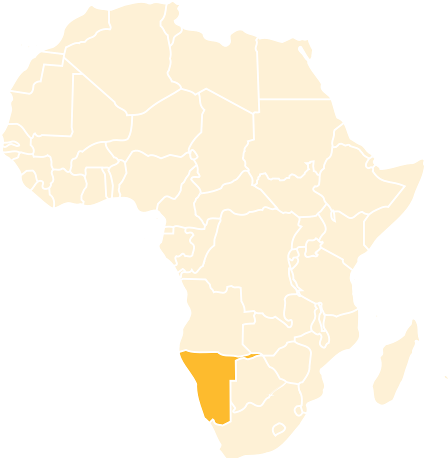
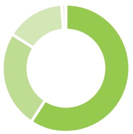
Namibia



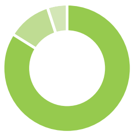


Energy Mix

Total Primary Energy Supply[1]

- **Liquid and gaseous fuels** < 60%
- **Electricity** = 25%
- **Biomass** < 15%
- **Renewables** < 1%

Oertzen, D. v., 2010: p. 6



Electricity Generation Mix

Total installed electricity capacity : 380 MW[2]

- **Hydro 240 MW** = 84.3%
- **Coal 120 MW** = 11.3%
- **Diesel 20 MW** = 4.4%

2 NamPower, 2012

Electricity Stats

Electricity consumption per capita = 1739.7 kWh[1]

Electrification rate

Urban = 70% **Rural** = 15%

1 Trading Economics, 2012

BACKGROUND & POLICY DRIVERS

For decades Namibia has had to import most of its electricity from surrounding countries. In 2011 the share of imports accounted for about 60% of its electricity consumption via the Southern African Power Pool arrangement,[1] despite Namibia's aim to cover 75% of electric energy demand from internal sources by 2010.[2] Most of the country's demand of 600MW is consumed by the industrial sector – with one third alone going to the Scorpion Zinc Mine, and only 34% of the population currently have access to electricity.

Namibia's government-owned national utility, NamPower, has warned of dramatic electricity price hikes. A 17.2% rise is in place for 2012-13, but according to NamPower's CEO, Paulinus Shilamba, prices are predicted to as much as double by 2016.[3] The reasons for this development include region-wide electricity shortages and the government's declaration to make electricity prices cost-reflective and end current subsidies. Extra money is also needed to pay for new domestic generating capacity to meet the 2016 target of self-sufficiency and protect Namibia from external shocks.

ORIGINS OF THE REFIT

Namibia currently has no legal framework in place to support renewables, with existing policies supporting all technologies. Previous efforts to solve the power supply crisis focused on market liberalisation by permitting IPPs. However, despite local and international private sector demand to develop new capacity this did not result in new projects. While new licences were issued, including three wind and seven solar projects, observers blamed the failure to complete the projects on the unresolved conflicts between project developers and NamPower over tariff levels. The resulting criticism from the private sector, which had already paid for pre-feasibility studies, combined with the continued energy supply crisis, led the state regulator Electricity Control Board (ECB) to search for answers once more, specifically looking at renewable technologies.

In mid 2011, the ECB published recommendations, based on stakeholder workshops involving NamPower, the Ministry of Mines and Energy (MME) and interested private investors. The suggested approach promotes three parallel mechanisms to facilitate renewables: tendering, net metering, and Feed-in Tariffs.

Tendering

At time of writing, all renewable energy technologies were eligible for tender, with a minimum capacity set at 10MW. The first call for tenders is estimated to be published in October 2012. The RE projects already under negotiation will most likely be included in the tender if no agreement can be reached beforehand.

Net metering

An 8-month pilot programme was launched in mid-2012 following demands from individuals across the country for a policy supporting the installation of solar home systems with the possibility to feed the excess electricity into the grid. Although no official purchasing arrangement exists, two of Namibia's regional electricity distributers are already buying electricity from small producers at the average annual price charged by NamPower. However, private sector stakeholders complain that this price is not high enough to encourage a wider uptake of net metering.

REFiTs

The policy is still under development, but according to a member of the ECB it will most likely cover wind, hydro, and biomass, with a maximum capacity set at 10MW. NamPower is especially interested in biomass because it produces constant power rather

1 The biggest suppliers are Eskom in South Africa, DRC, Zambia and Zimbabwe. See: ECB, 2010: p. 46.

2 Ministry of Energy and Mines, 1998.

3 Corruption Watch Namibia, 2012.

than irregular sources such as solar or wind power. Tariffs are likely to be based on cost-generation with a reasonable return on investment, although there is currently no indication as to how the policy will be paid for. Namibia is looking at standardized PPAs to avoid time-consuming negotiations, with payment duration estimated to be 20 years.

The ECB has begun internal development on a policy framework with support from USAID, and according to the regulator, will soon open up the process to IPPs, utilities and other government departments. However, civil society has not yet been invited to be part of the process. Many stakeholders see a greater chance of inclusion if the policy focuses on implementing the REFiT off-grid.

BARRIERS

Namibia has little experience in renewable energy, but according to an expert who has worked extensively across the Namibian energy sector, NamPower has enough technical experience and capacity to meet the challenge. However, while the utility may be capable of handling decentralised renewable generation, the lack of political will remains a major barrier. Low prices are seen as a good way to secure votes and with the REFiT predicted to increase electricity prices further, attracting political support may be difficult.

OUTLOOK

Namibia's REFiT suffers from the common tension between affordable electricity for the consumer and attractive tariffs for the producer. One civil society stakeholder points out that the NamPower's harsh negotiating stance, strengthened by its status as the single buyer within the market, could bring about too low tariffs. All stakeholders agree that REFiTs will increase electricity prices in the short and medium term. However, while a civil society stakeholder blames NamPower's monopoly, a member from the regulator blames the higher generation costs of renewable technologies but expects they will have a competitive advantage over conventional fuels in the long-term. It seems unlikely, at least in the short term, that the government will be able to stop all subsidies. The CEO of the ECB, Simasiku, has recently confirmed that the regulator is still working on a pro-poor tariff methodology.[4]

While stakeholders disagree on the potential impact of the REFiT, both regulators and civil society stakeholders concur that if combined with other programmes, it could have a very positive effect on rural electrification and consequently rural development. However, for communities to benefit properly, this would need to be accompanied by an awareness raising campaign, which is currently lacking.

More generally, Namibia has to find a way to reduce its expensive electricity imports and improve electrification rates. The three options of tendering, feed-in tariffs and net metering provide a promising solution by addressing different scales of projects. Net metering could improve the RE power generation on a household level, while Feed-in Tariffs could foster the development of small, localised power plants. Finally, tendering could increase the centralised power generation.

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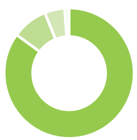
Nigeria



Energy Mix

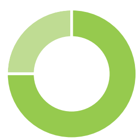
Source: International Renewable Energy Agency, 2012

- **Biomass** = 85%
- **Oil & Oil products** = 9%
- **Natural Gas** = 5%
- **Hydro** = 0.4%

Electricity Generation Mix

Total installed capacity (2002)[1]
Total: 6,168 MW

- **Thermal (oil, gas)** **4,238 MW** = 69%
- **Hydro (large)** **1,930 MW** = 31%



Electricity Stats

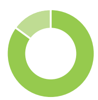
Actual generation capacity (2010)[2]
Total: 3,825 MW

- **Thermal (oil, gas)** **2,875 MW** = 75%
- **Hydro (large & small)** **1,230 MW** = 25%

Consumption per capita (2009)[3] = 120.5KWh

Electrification rate

National = 50%



Urban = 85% **Rural** = 31%

1 Federal Ministry of Power and Steel, 2006

2 The Presidency of Nigeria, 2010

World Bank (2011)

Nigeria REFiT Design

FIT Design Features	**Nigeria**					
Integration with Policy Targets	Expand the market for renewables to at least 5% of total capacity and minimum of 5TWh by 2016 At least 10.5% share of renewables in the national electricity mix by 2025: Small hydro: 2,000MW Solar PV: 500MW Biomass: 400MW Wind: 40MW					
Eligibility	Small hydro (< 30 MW) Solar PV Onshore wind Biomass					
Tariff Differentiation	Technology	Currency	2012	2013	2014	2015	2016
	Biomass Small hydro Solar PV Onshore wind	USD/kWh	0.172 0.148 0.427 0.154	0.186 0.160 0.461 0.167	0.201 0.173 0.497 0.180	0.217 0.186 0.537 0.195	0.235 0.201 0.579 0.210
Interconnection Costs	Grid studies and any upgrades must be paid for by the generator, except where the embedded generator connects to the transmission network, in which case the generator may recoup the cost of any such connection upgrades					
Purchase and Dispatch Requirements	Current regulations in Nigeria do not oblige distribution companies or the bulk trading company to purchase or even prioritize electricity from renewable generators qualifying under the REFIT					
Purchasing Entity	Distribution companies or the bulk trading company					
Triggers & Adjustments	The Multi Year Tariff Order sets an overall cap of energy from renewable sources at 10% of total energy sent to the grid					
Payment Currency	Local currency adjusted to local inflation					

BACKGROUND & POLICY DRIVERS

Nigeria is one of the biggest oil exporters in the world, and both its economy and energy-supply are highly dependent on it. Despite heavy investment in the electricity sector, huge wastage and inefficiency prevail, and just over half the population remains unconnected to the grid. Grid electricity is cheap because of subsidies, but highly unreliable with 12-hour daily periods of load shedding. This has forced individuals and businesses to rely on costly and polluting diesel generators.[1] While large-scale hydro accounts for around one third of the country's generation capacity, renewable energy in Nigeria has traditionally been uncompetitive in comparison to subsidised fossil fuels.

Between 2003 and 2010, a series of national energy policies saw Nigeria attempt to liberalise its market and set renewable energy targets of 5% by 2016 and 10.5% by 2025. In 2010, an Inter-Ministerial Committee on Renewable Energy and Energy Efficiency was formed to coordinate activities[2] and – according to the Nigerian Electricity Regulatory Commission (NERC) – played a key role in developing a REFiT. The policy was officially launched in May 2012[3] after two years

1 Self-generation of electricity from Nigeria's 60 million diesel and petrol generators was about twice the average output from the national grid during 2009 (~6,000 MW), see Energy Commission of Nigeria website: http://www.energy.gov.ng/index.php?option=com_content&task=view&id=51&Itemid=58 (1/10/12).

2 F. N. A.Olapade, 2012

3 Nigerian Electricity Regulatory Commission, 2012

of consultation with stakeholders. The policy's key aims were increased domestic electricity production, particularly from distributed sources; a more stable supply; technology transfer and local capacity building; environmental sustainability (reduced deforestation and greenhouse gas emissions); increased tax revenue; encouragement of private sector participation; and the integration of increased energy access with wider rural development.[4]

The business community was heavily involved in the consultation. Organisations such as the Manufacturer's Association of Nigeria (MAN) had been lobbying strongly for a REFiT to address the lack of electricity supply, frequent power cuts and high costs for back-up electricity generators. However, civil society was excluded from the process until the REFiT design had been virtually finalised. One civil society interviewee puts this down to a lack of government willingness to engage.

The new tariffs distinguish between technologies but not by size of generating plants. However, there are many reasons to believe Nigeria's REFiT favours small-scale generation below 10MW. The tariff level has been set to provide an attractive investment for 5-10MW, and one interviewee points out that the generous tariffs mean even 500kW projects will be viable. Smaller projects also face lower transaction costs under the REFiT and are automatically accepted by NERC rather than going through lengthy grid integration-related bureaucracy. Additionally, generators below 1MW – and distributors below 100kW – currently do not need a licence to operate.

The amount of renewable energy produced under the REFiT is capped at 10% of total energy sent to the grid. The cap, according to a commentator on the policy, has likely been set due to three factors: (a) to enable the grid system operator to gain experience with integrating renewable power generation before allowing more producers to be connected, (b) to allow any renewable energy cost implications to be evaluated and spread over time and (c) given the emphasis on smaller scale projects, to limit any adverse voltage level or stability issues in the grid.

4 Energy Commission of Nigeria, 2005; The Presidency of Nigeria, 2010

BARRIERS

Many challenges will need to be overcome if Nigeria's REFiT is going to achieve its aims. Inconsistency between policy documents and overall ambiguity has produced uncertainty, such as the lack of clarity over the legal obligations for distributors to purchase renewable energy. One interviewee explains that this results from a current lack of legal expertise in the area of feed-in tariffs. A lack of technical capacity has also been highlighted as a barrier by another interviewee, while the poor quality of the existing grid has been raised as a problem for increasing the amount of renewable power being connected.

According to one energy-focused non-governmental organisation, community organisations face particular barriers in Nigeria. Their lack of technical capacity, lack of access to finance and their inability to absorb shocks makes it difficult for them to take advantage of the REFiT. A large degree of distrust also exists among communities in Nigeria towards renewable energy, particularly solar PV, due to the large numbers of failed projects. The government's inability to scale up those projects that did succeed, or engage in wider awareness raising, has left that notion unchallenged. The Rural Electrification Agency (REA) also does little to promote local, off-grid generation from renewable energy, instead focusing solely on grid-expansion. However, unless REA abandon business as usual, the REFiT will not deliver the rural development outlined in its aims.

The final barrier raised by interviewees was political will. A successful REFiT, as a driver of a wider programme of rural development, will need continued political support and finance. One civil society stakeholder questioned the government's willingness to put forward sufficient funding. Like many West African governments, he said Nigeria preferred to look to international investors in Europe or Asia who themselves favour projects of scale.[5] He also cautioned against relying solely on the private sector, as it would not drive the process alone, though it will be important in scaling up and distributing technology. For this, a strong government with strong civil society involvement would be necessary, aiming for generation targets well above the current 10.5% by 2025.

OUTLOOK

No projects have been yet approved, although NERC indicates that some developers have applied for generation licences based on solar PV. All stakeholders interviewed welcome the REFiT as a way to tackle the chronic power shortages and high costs of diesel generators. Developers and NGOs alike see the lack of stable energy supply as Nigeria's biggest barrier to economic growth, with one interviewee saying businesses were leaving Nigeria because of it. However, one civil society stakeholder pointed out that the policy does not provide attractive returns at the household level, for example through net metering. This could incentivise homes and businesses to swap diesel generators for solar PV panels, removing the reliance on generators and the unstable grid completely.[6] There is disagreement among interviewees on the impact the REFiT will have on prices. Whether it will lead to prices to rise as the cost is passed on to consumers or drop due to abandoning diesel generators, it is part of a wider move towards privatising the electricity market, which is predicted to increase prices.[7]

The predicted impact on rural electrification is also mixed. On paper, the focus on small-scale generation means anyone can take part. However, they must be close to a grid or already connected, and have sufficient technical, legal and financial expertise to take part. Most stakeholders interviewed see the REFiT primarily operating in urban and peri-urban areas where it will be easier to make a return, spreading to rural areas once the concept is proven. One interviewee was worried this would take as long as 5-10 years due to lack of political will and the on-going exclusion of civil society from the policy process. To reach rural areas and enable community participation, stakeholders emphasised that the REFiT should be fully integrated with other rural development policies and support mechanisms, in particular the work of the REA, with efforts spent on awareness raising.

The unexplained resignation in August 2012 of the Minister of Power means the REFiT policy loses a strong proponent at the highest level of government. It remains to be seen if this change will lead to further delays in the implementation of the policy or if the Minister's replacement will be a supportive advocate. The focus on large-scale generation and the current gas bonanza in Nigeria and much of the continent both threaten the REFiT. There is still discrepancy between several experts on whether Nigeria is ready for a REFiT or not. One commentator noted that the wider political, economic and social environment in Nigeria is "ripe for a FIT" while another expert asks for an overall improvement in terms of legal framework and rule of law in the country to encourage more investment in renewables.

5 At the time of writing, Nigeria had recently awarded two large hydro contracts to the Chinese Sino Hydro Corporation ($3.2bn for 3,050MW) and the China National Electrical Equipment Corporation ($1.2bn for 700MW), Daily Trust (2012)

6 By not allowing individuals and businesses to take part in the policy, they must still rely on the grid until it improves, rather than securing their own supply. One suggestion given for this was the 'generator mafia' who are close to government and prevent legislation that may impact their business interests. See http://www.iied.org/privatising-nigeria-s-power-sector

7 IIED, 2012

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CHAPTER

V

Alternatives Beyond the Grid

Extending the grid has a role to play, particularly in urban and peri-urban areas, but it so far has failed 85% of the continent's population[1]. As many live in remote rural areas, grid extension is very costly. The World Bank estimated the average cost to be between US$8,000-US$10,000 per km, and as much as US$22,000 per km in difficult terrains.[2] Almost 70% of the population live on less than two dollars a day[3] with little ability to pay, so when combined with the high cost of grid extension, utilities do not view it as cost-effective.[4] Nonetheless, grid-extension remains the default approach for most African governments, with the cost passed on to new and existing energy users.[5] This is because energy provision is seen as an income generating activity for utilities, rather than a public service.

For governments undertaking rural electrification programmes themselves, mini-grids are often cheaper than grid extension. They are also a more efficient approach, reducing transmission and distribution losses and reducing theft[6], and once integrated can increase grid stability. The International Energy Agency predicts that by 2030 70% of rural electrification will be met through mini-grid or stand-alone systems.[7] The international Renewable Energy Policy Network REN21 states that - with an average electrification rate of only 30% - sub-Saharan Africa has no choice but to facilitate modern decentralised solutions.[8] Currently, off-grid solutions rely heavily on fossil fuel generators. This chapter presents renewable alternatives and discusses how REFiTs can be adopted to promote them as part of rural electrification programmes.

1 IEA, 2010.
2 NRECA, 2000.
3 World Bank, 2012.
4 ARE, USAID, 2011.
5 The electricity bill of one South African interviewee reveals that public utility Eskom charges new rural customers ZAR 1,000/US$ 110 a month for the network connection, before any electricity is consumed
6 Yadoo, A., Cruickshank, H., 2010.
7 IEA, 2010.

ISOLATED RENEWABLE ENERGY ALTERNATIVES

Solar Pico Systems

The most prevalent sources for lighting in Africa's remote regions are currently candles and kerosene,[9] the kerosene lamps exposing them to carbon monoxide, carcinogenic gases and fire hazards from open flames.[10] Solar pico systems (SPS) are one fast-growing alternative that is clean and affordable. The most common forms are 'solar lanterns' and 'solar kits'. The basic models consist of a solar PV panel, an inverter, and a battery and are sold as 'ready to use' packages, not requiring technical expertise or installation. The solar lanterns in the upper price segment also have in-built phone chargers and in some cases an exit to run other small electronic devices, mainly radios. High-end kits with a bigger panels and battery capacity can provide light for several rooms and run small household devices.

8 REN21, 2012.
9 ARE, 2011.
10 Practical Action, 2012.

Solar Home Systems

Solar Home Systems (SHS) are a standalone appliance commonly used to provide energy for a single household. The higher power output provides more potential services. Depending on the size of the solar panel and battery, SHS can generate enough electricity to run consumer electronics such as radios, TVs, or fridges. However, unlike the pico systems, SHS require professional consultation, installation and service. For communities without access to electricity, SHS are considered to be one of the next best solutions and are increasingly becoming a more affordable option for sustainable energy access than the traditional diesel-powered generators. SHS can also provide energy for productive uses, such as powering water pumps for clean drinking water and local irrigation,[11] and for local businesses. South Africa intends to install 10,000 domestic units every year to compliment its grid extension programme and governments across Africa are turning to standalone SHS to power public buildings, such as health centres in Rwanda or secondary schools in Tanzania (see chapter III).

MINI-GRIDS

Mini-grids, also known as micro-grids, allow the connection of entire villages, or multiple villages, rather than individual homes. While isolated systems work for scattered households, mini-grids are far more appropriate where households are clustered together. As well as satisfying domestic electricity needs, they can power local enterprises like workshops or mills, public facilities and community-scale needs such as public lighting. They provide many of the benefits of a grid in areas where the grid is unlikely to reach or where reliability of supply is poor.

Mini-grids have traditionally been powered by noisy and polluting diesel generators, but with the tumbling price of renewable technology and the rising cost of oil, renewable-powered mini-grids are often the cheaper option.[12] Electricity generated from solar energy also has the advantage that periods of highest solar radiation (mid-day) are also times when electricity for productive uses, such as small-scale agriculture or micro-enterprises, is most needed.[13] In order to provide reliable energy at night, hybrid technology systems rely on several renewable sources (i.e. wind or biogs), thus making the use of diesel generators unnecessary.[14] Another way to ensure reliability of service across such a small grid is to mandate on-site storage, as Tanzania regulator EWURA has done. Addressing demand side consumption, for example through energy efficiency or behaviour change, is another particularly important tool for balancing mini-grids..

11 Practical Action, 2010.

According to energy access practitioners, building successful mini-grids requires a high-level of community participation, determining local wants and needs and harnessing local knowledge and capacity for installation, operation and bill collection. Partnerships between communities and those with the technical know-how are often perceived as the best way to overcome the technical barriers, and can lead to the transfer of knowledge over time. [15]

MINI-GRID OWNERSHIP STRUCTURES

Ownership structures for a mini-grid system will depend on who's implementing the project, what the goals are, and what the local socio-economic and cultural conditions on the ground are. While each structure will be unique, there are four basic ownership structures for village-scale mini-grids: community-based model, private sector operator, utility-based approach and hybrid model.[16]

12 IEG, 2008.
13 Ensuring a constant electricity supply can also be achieved through a hybrid mini- grid, combining different renewable sources as well as batteries and storage devices.
14 see Yadoo, A., Gormally, A., Cruickshank, H., 2011 and IEA-RETD, 2012.
15 This is based on a series of recent workshops and presentations, see: United Nations Foundation, 2012: Facilitating Energy Access and Security: Roles of Mini/Micro-Grids.
16 GVEP International, 2011.

Community-based model

The community becomes the owner and operator of the system, providing maintenance, tariff collection and management services. One such example is in Indonesia, where a local NGO, IBEKA, helps rural communities establish and manage their own micro-hydro cooperatives. The initial technology is grant-funded, but each household pays US$1 per month for operation, maintenance and a community fund.[17] Government attempts to set up such cooperatives, notably in Tanzania and Burkina Faso, have led to failure as the resulting organisations have lacked both the technical capacity and the political and economic clout to be effective.[18] But there is some positive experience with cooperatives initiated by churches or NGOs. Moreover, cooperatives are becoming increasingly popular in other parts of the economy, such as agriculture or textiles, and the experience gained here could help spur development in the energy sector.

Private sector operator

In a private sector-led system, a private operator will establish the mini-grid and the source of generation. However, the model can vary greatly, depending on whether the private operator initiates the project, whether or not ownership of the grid is maintained by a state utility, how the electricity is sold to consumers (directly or via a utility) and what sort of financial incentives are available to allow for private operators. In Somaliland and Puntland, private sector investors have invested in diesel-generated mini-grids in urban and peri-urban areas, connecting 68% of the local population and accounting for more than 90% of all electricity consumption in those areas.[19] Originally in India and now in Kenya, mobile phone operators are powering their telecom masts through solar panels and selling the excess electricity to local customers through a mini-grid. This not only pays for the panels, but more importantly to them, allows their customers to charge their mobile phones and therefore use them more regularly.[20]

Utility-based approach

The mini-grid is operated and maintained by a utility, which can be a state-owned national utility, private investors, or a cooperative. The utility would be responsible for all or part of the distribution system, while the generation of electricity could still be owned separately.

Hybrid Business model

This approach combines the community, private sector and utility approaches to maximise the effectiveness of each. Models can be very diverse, combining various combinations of ownership and operation across the system. For example, in Rwanda, although the government is supervising the construction of off-grid micro-hydro generation to feed local mini-grids, once complete the micro-hydro will be privatised (see chapter III). In Mali, local agricultural cooperatives grow and process jatropha to make fuel, which is then used by a local company, ACCESS, to generate electricity. ACCESS won a 15-year concession from the Ministry to manage the production, distribution and billing for electricity, while the tariffs are set by the Ministry in collaboration with consumers, the local council and the jatropha growers.[21]

17 For more information, see http://www.ashden.org/files/IBEKA%20full%20winner.pdf

18 Nygaard, I., 2009 ; lskog, E. et al., 2005.

19 GVEP International, 2011.

20 For more information, see the Smart Power for Environmentally-sound Economic Development (SPEED), http://www.smartpower-india.org/

21 See the full case study at http://www.inforse.org/Case/Case-Mali-biofuel.php3

Table 1: Advantages and Disadvantages of mini-grid ownership structures
(Source: GVEP International, 2011)

Model	Advantages	Disadvantages
Community	• Increase ownership which improves maintenance • Can be more efficient than bureaucratic utilities	• Communities may lack technical and business skills (e.g. design and installation ; tariff setting). leading to higher costs to bring these in • Governance of systems needs to be well managed.
Private	• Greater efficiency • May have capacity to offer better operation and management services • May be better able to navigate political interference	• Lack upfront financial support in most cases • Often difficult to find enough experienced companies, so often schemes are run by smaller companies with less capacity
Utility	• Responsibility lies with an experienced organisation • Often good links to policy so have better access to legal system • Their scale means that they may have better access to spare parts and maintenance	• Liberalisation means that they are market driven, so many not prioritise decentralised systems in rural areas • Often inefficient and bankrupt • Often driven by political agencies
Hybrid	• Combine the advantages of the models above such as the technical expertise of a utility and financial expertise of the private sector	• Difference in the management systems of each entity can increase transaction costs

MINI-GRID RENEWABLE ENERGY FEED-IN TARIFFS

Mini-grids are one vof the most cost-effective ways of delivering rural electrification and can play an important role to reach Africa's 650 million people who remain without electricity by 2030 in accordance with the aims of the UN Sustainable Energy for All initiative. However, to unleash this potential supportive policies and incentives for all stakeholder are needed. The REFiT can be a powerful tool in this context. While traditionally thought of as an on-grid mechanism, it can also be adapted to work in off-grid environments.[22] In 2009, Tanzania was the first country to introduce a REFiT for mini-grids as well as on-grid (see chapter VI), with two hydro projects due to come on line in 2014. It is based on the same principle an on-grid REFiT, providing a long-term guaranteed return on investment through payments for electricity generated, but configured to suit the financial context of mini-grids. Combining a REFiT with mini-grids can bring down initial capital costs for investors, keep prices low for consumers, and make previously unviable projects viable.

A mini-grid REFiT can be based either on a single generating source, such as small hydro as we're seeing in Tanzania and Rwanda, or a hybrid approach. Solar PV provides a good complimentary source and can easily be

22 See for example the work of the EU Joint Research Centre, Moner-Girona, M., 2008.

provided through decentralised community-wide generation. This would enable wider participation and ownership of the system, as well as democratising generation. A net metering policy could be used to incentivise the uptake among the mini-grid users, displaying the same characteristics as the net metering policy in Mauritius or Namibia. Households could either own the systems themselves, paying back the upfront finance through the REFiT, or a utility (cooperative, public or private) could own, operate and maintain, providing them with low-cost electricity and ensuring that part of the tariff goes into a community fund. The options are varied, and the technology already exists: Zimbabwe's ECOnet and similar 'pay-as-you-go' solar providers are combining smart energy monitoring with mobile banking for their energy customers, which could equally be used to monitor and then pay solar home generators for their excess energy production.

FINANCING OFF-GRID ELECTRICITY ACCESS

As with on-grid technologies, financing renewable energy technologies in off-grid contexts is a challenge. While the technologies are usually cheaper in the long run, they require high initial investment costs, thus making them unaffordable for low-income households with little or no savings. In Tanzania for example, where the average family spends US$61 on lighting per year, a simple solar lanterns costs between US$20 and US$40. Access to credit is thus an important feature to promote this technology. Microfinance institutions are becoming increasingly involved, while retailers are also developing credit schemes.

Solar Home Systems require larger investments. While governments and international donors have provided support in some countries,[23] these programmes are often limited in scope. Multiple financing options are emerging, such as crowd-funding, technology-targeted remittances, government-backed micro-loans or subsidies. In Zimbabwe, the mobile phone company ECOnet has become an off-grid utility, installing systems on customers' homes and allowing customers to pay for their usage via mobile phones, avoiding the upfront costs.[24] It allows users to increase their generating capacity as their income increases, and also offers the option of slowly paying-off the total cost of the system and eventually owning it. However, pay-as-you-go solar generation is only available to the producer household and thus potentially wasted at times when the customer is unable to pay for electricity. This does not happen in a mini-grid model, because the energy produced is made available to all customers connected to the grid.

To promote mini-grids, a reliable and long-term framework for investment is crucial, alongside local capacity building and training. A modified REFiT can be a good solution and is being implemented in Tanzania (see chapter VI). In Indonesia, where community-owned minigrids are already enjoying REFiT payments, the guaranteed income has meant micro-hydro projects can be financed via debt rather than grants. The extra income has also been spent on a community fund, paying for the connection of poorer villages, improving healthcare, repairing local roads, piping drinking water to all homes and providing low-interest loans for buying agricultural inputs or setting up small businesses. However, both Moner-Girona (EU-JRC) and GVEP International, who have explored mini-grids in Africa extensively, believe international donor support will be necessary to catalyse the increased uptake of mini-grids in Africa, either to pay the REFiT or the upfront financial costs. Friends of the Earth and the World Future Council have both proposed a global fund to cover such costs (see Chapter VII).

23 In Tanzania, the Rural Electrification Agency (REA) set up a financial plan with 1,000 off-grid farmers for solar systems. The REA pays 20%, the farmer pays 20% upfront, and then pays the remaining 60% over the following three years.

24 For more information, see http://www.econetsolar.com/default.cfm

OUTLOOK

Rural electrification is rightly a key priority for most Sub-Saharan African governments as well as donors. Sustainable energy solutions are already providing Africans with access to modern energy services such as electricity, pursuing a low-carbon development path that is cheaper, healthier and in the longer-term interest of the planet. Solar lanterns make a considerable difference to quality of life and a child's ability to study in the evening and are predicted to save 800,000 premature deaths annually.[25] However, it is at the village level, through renewable energy mini-grids, that social and economic development is really catalysed. Barriers to their establishment need to be addressed, and while there is no one-size-fits-all approach, governments and donors can help build local technical, administrative and financial capacity. But as Villate highlights, for a mini-grid project to succeed, it should be cooperative, based on the wants and needs of the local community (which may progress over time), take a longer-term approach and 'be guided by the strong purpose of transferring all the information needed to local people to be able to walk alone'.[26]

Given the economics of grid-extension, available funds could be spent much more effectively by supporting the construction of mini-grids. Combining this with a REFiT has the potential to lower some of the barriers and increase mini-grid project viability. It could also provide extra stimulus to the local economy through direct financial transfers and job creation, benefiting the wider rural economy through a redistribution of wealth to oft-neglected areas.

25 This figure is based on the assumption by the IFC on everybody switching from kerosene to modern lighting solutions, see IFC, 2012 .

26 Villate, J. L., 2008: p. 72

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CHAPTER

VI

How Tanzania's REFiT Promotes Mini-Grids

BACKGROUND & POLICY DRIVERS

Like in most African countries, Tanzania's electrification rate is lowest where the vast majority of its population lives – in the rural areas. The low density of rural settlements and the long distances between them lead to high costs of connection to the national grid. Tanzania's Rural Energy Agency (REA) cites a cost of US$ 40,000 per kilometre. A viable alternative is the establishment of local mini-grids, producing electricity where it is needed and thus avoiding costs for long-distance distribution (see chapter V).

Tanzania is one of the few countries in the world with a REFiT strategy that explicitly supports mini-grids. In developing this policy, Tanzania was able to draw on a long history of diesel and hydro mini-grids dating back to the 1960s.

TANZANIA'S MINI-GRID REFIT

Tanzania's Small Power Producer (SPP) REFiT has similar design features for both its on-grid and off-grid component, i.e. a long-term fixed payment for the electricity generated (see table 1 for more details). There is no cap on the size of generating technology, although a maximum of 10MW can be exported to the grid. All renewable technologies are eligible, and the payments are based on avoided cost. IPPs – who include private project developers, community cooperatives, local authorities, churches and international NGOs – can either feed-in to existing mini-grids that are run by the state utility TANESCO, or they can create new ones and provide energy directly to previously unserved communities. Existing power plants are not eligible for the REFiT, as the policy has been ring-fenced for new capacity.

Table 1. Tanzania Mini-Grid REFiT Design Features

Integration with policy targets	• 2003 National Energy Policy
	  • Introduce appropriate rural energy development, financial, legal and administrative institutions
	• 2005 Rural Energy Act
	  • Created the Rural Energy Agency (REA), Rural Energy Board (REB), and Rural Energy Fund (REF)

Eligibility	• Eligible projects are restricted to be at least 100 kW and export no more than 10 MW. • SPPs can sell to a mini-grid or direct to retail customers • Stand alone off-grid projects are not eligible
Tariff Differentiation	• There is no tariff differentiation based on technology, size, fuel type, or application. Tariff is differentiated depending on whether the SPP is grid-connected or mini-grid. • Sold to Mini-Grid (2012): 480.50 TZS/kWh • Sold to Customer: Tariff rates must be approved by EWURA • 183.05 TZS/kWh; Wet Season 137.29 TZS/kWh; Average 152.54 TZS/kWh
Payment Based On	Sold to a Mini-Grid: 'Avoided' Costs. Average of long-run and short-run marginal costs, including the average incremental levelised cost of electricity from a new mini-grid diesel generator. Sold to Customer: 'Cost' Based. Actual or projected total costs plus a reasonable profit for the portion of electricity sold to retail customers.
Payment Duration	15 Years
Payment Structure	To a Mini-Grid: A price floor is set at the year in which the contract was signed (X0) and a cap is set at 150% (adjusted in accordance with the Consumer Price Index) of X0 Direct to Customer: The 'cost-based' retail price is submitted to EWURA for approval.
Cost Recovery	Because generators are paid tariffs that are below the marginal cost of new electricity procurements, there are arguably few or zero incremental costs to recover. The Rural Energy Fund is an additional form of cost recovery.
Interconnection Guarantee	The policy expects all mini-grids to be connected to the national grid within 15 years.
Purchase And Dispatch Requirements	Guaranteed purchase if feeding in to a TANESCO-operated grid and technical requirements are met
Amount Purchased	100%
Purchasing Entity	Distribution Network Operator (DNO) or retail customer
Commodities Purchased	Electricity
Contract Issues	Standardized contract (Power Purchase Agreement)
Payment Currency	TZS

Interaction with Other Rural Electrification Incentives	**1.** TEDAP provides US$500/connection grants in rural areas. **2.** For projects that sell direct to customers, TEDAP will cover up to 80 percent of the transmission and distribution construction costs, including high-voltage/low-voltage lines, meters, and providing access points. The grant money is disbursed 40 percent upon signing the agreement, 40 percent upon materials at site, and 20 percent upon completion of the project **3.** TEDAP provides technical assistance to local commercial banks to help them accurately appraise projects, as well as pre-investment support to developers for business and market development. **4.** TEDAP has a US$23 million credit line, which provides financial institutions that lend to eligible rural/renewable energy projects a 15 year loan at an interest rate that is linked to the average term deposit rates (~8-9 % revised every six months).

KEY AND UNIQUE FEATURES

Tariff-setting

The tariff is based on avoided cost. For mini-grids, this means the operational cost of a diesel power plant is used as a base line, which explains why on average, mini-grid tariffs are more than three times those of on-grid tariffs.[1] For those feeding-in to existing grids run by TANESCO, its long-run marginal costs for running the grid are also factored in. Tariffs for IPPs building new grids will combine the cost of diesel generation with a 'reasonable profit'. To avoid unnecessary bureaucracy, the Energy & Water Utilities Regulatory Authority (EWURA), who is in charge of PPAs, has devised a streamlined process for approving 'reasonable' tariffs.

Long-term grid connection

Tanzania has designed its REFiT with the assumption that all mini-grids will be connected to the main grid within 10-15 years. If the grid arrives any time before the end of the agreed 15-year PPA, then the contract is immediately switched to a standardised on-grid PPA. If it is a non-TANESCO mini-grid, bill payers will then have a choice on whether they stay with the current IPP or move to on-grid provision provided by TANSECO. To reduce the risk for investors and project developers – as grid connection could undermine the business model – the government provides an estimation of when the grid is expected to arrive, as well as annual updates.

External Factors

Renewable energy projects regularly face scepticism in rural areas, often due to failed projects that have relied on sub-standard technology. This problem is exacerbated by a lack of locally available technical expertise, which is particularly difficult to build up given the distance from urban centres and the dispersed nature of projects. On the other hand, Tanzania's successful history of community-based mini-grids also provides positive examples and, in addition to technical knowledge, valuable experience with cooperative business models. Church missions have played a major role in early Tanzanian mini-grids. As early as 1979, the Roman Catholic Diocese of Iringa set-up a mini-grid to serve a mission hospital and later extended to surrounding villages. The 140kW mini-hydro plant serving 309 households, 9 institutions and 18 commercial enterprises is owned by the Diocese but managed jointly by a multi-stakeholder village committee and the mission hospital. A variety of mini-grid ownership and management models exist in Tanzania (for a description of different models of mini-grid ownership, see Chapter V), but the most successful have been embedded in the local community involving all local stakeholders, and have tackled the technical, managerial and financial barriers (see examples in table 2).

As with REFiT projects more generally, mini-grids suffer from the insecurity of land rights – a problem that may actually be worse in rural areas.

Concerning cash flow, the uncertain credit-worthiness of TANESCO is a problem for mini-grid connected to the main grid. Independent mini-grid projects face similar problems with the local consumer's ability and willingness to pay their bills.

On the positive side, a lot of financial support exists for rural electrification, covering both grid-connected generation and isolated mini-grids. The TEDAP programme, funded through the World Bank and the Global Environment Facility (GEF), provides US$500 for each household connection, as well as covering 80% of all transmission and distribution cost.[2] The programme also provides technical assistance to help local commercial banks, and has extended a US$23m credit line to financial institutions that lend to eligible rural and renewable projects on commercial terms.

IMPACTS

Introduced in 2009, the REFiT policy is still in its early stages. To date, only one mini-grid contract has been signed but two mini-hydro plants totalling 7MW are due to come online by 2014, completely displacing the current diesel power source in their respective areas.[3] According to the REA, a total of 17 off-grid projects are in the pipeline. Projects are by both private sector developers and communities/cooperatives, with a total combined generation capacity expected to be 46.2MW, providing 8,400 new connections for households, small businesses and public facilities.[4] Ring-fencing the policy for new generation has also successfully incentivised many existing mini-grid operators to apply for licences to install new turbines and extend their grids, including the Roman Catholic Diocese in Iringa.

The avoided-cost methodology of the REFiT means that expanding energy access through renewable technology is no more expensive for the government than it would be through fossil fuels. However, it also means that while all technologies are eligible, only economically viable 'low hanging fruit' like hydro and bagasse co-generation are being pursued, which can limit the range of projects – and therefore the number of new connections.[5] Also, while the performance-based payment system incentivised new connections, there is still no guarantee of an affordable or reliable service, or wider developmental benefits (see chapter V). Regarding affordability, the cost for rural customers remains far above that for on-grid customers. The lack of a comparable off-grid consumer subsidy means all costs are passed on directly to energy users. The REFiT may not have improved affordability in the immediate term, but replacing diesel protects mini-grid energy users and operators from increasing overheads.[6]

OUTLOOK

Tanzania is the only country in this book with a comprehensive off-grid REFiT aimed explicitly at rural electrification.[7] However, due to limited national budgets the Rural Energy Agency is investing in renewable energy only where it is already cost-effective and continues to rely on fossil fuels elsewhere.

1 The tariff for feeding-in to existing mini-grids was 480.50 TZS/kWh in 2012; the corresponding average on-grid tariff was 152.54 TZS/kWh.

2 The grant money is disbursed 40% upon signing the agreement, 40% upon materials at site, and 20% upon completion of the project. World Bank (2012)

3 Climate & Development Knowledge Network (April 2012)

4 3 small hydro power projects, 2 biomass cogeneration projects, and 2 biomass gasification projects. Msofe, B.H. (2010)

5 Rickerson, W. et al. (2010)

6 Replacing the Songea and Mbinga diesel generators with mini-hydro as planned will save the equivalent of over $4 million, avoiding the importation of 7.2m litres of diesel, see CDKN (2012)

7 Kenya introduced a solar PV tariff in 2010 for mini-grids, but no other technologies are eligible.

This is problematic given that most projects currently in the pipeline are based on hydropower, which will face the adverse effects of climate change in coming years. Water shortages have already led to a loss in productivity in some of the existing mini-hydro plants. It will thus be important to promote a range of additional renewable energy sources. While the government has already removed import duties on solar PV to make renewable more competitive, more steps – and possible international financial support – are needed to make additional technologies attractive. Several models for such international support mechanisms have already been developed (see chapter VII), and a project currently piloted in Uganda could soon be broadened to the region, including Tanzania.[8]

As already discussed, the lack of local technical expertise is a major obstacle to fast growth within the domestic renewables sector in Tanzania. However, both REA and TANESCO have already taken steps to begin addressing the issue. REA is organising training workshops for particular technologies and, with the support of UNIDO, will establish a mini-hydro learning centre linked to similar institutions in Nigeria and India.[9] Further South-South learning opportunities with Sri Lanka and Thailand will be provided through TANESCO's SPP Cell. However, these steps alone will not be sufficient and should be complemented by additional programmes. International support should be considered, for example for long-term vocational training programmes.

Tanzania's energy policies are trying to address the needs of both the urban and rural population. They provide important incentives for investment in renewable energy technology, but seem to stop short of their full potential. International support to overcome budget constraints should be encouraged as an investment in a promising pilot project that could demonstrate the transformative power of renewable mini-grid solutions for rural communities all over Africa.

8 Rickerson, W. et al. (2010)

9 Tanzania Daily News (14 June, 2012) 'Rural electrification project in Tanzania gets boost', http://www.dailynews.co.tz/index.php/biz/6201-rural-electrification-project-gets-boost

Table 2. Off-Grid REFIT Projects in Tanzania[1]

Name	Developer	Total Installed Capacity (MW)	New Connections	Total Project Cost (US$ million)	SPPA-Main Grid (MW)	SPPA-Minigrid (MW)
Mbinga Mtambazi SHP (Ruvuma)	Andoya Hydro Electric Company Ltd	1.2	600	4.3	-	1.2
Mawenge SHP-MG (Iringa)	Njombe Roman Catholic Church	0.3	300	0.9	-	
Njombe SHP (Iringa)	Njombe Roman Catholic Church	4.6	1,500	11.6	10.0	
Mufindi SHP (Iringa)	Mufindi Tea Company/ IDF	3.0	1,000	8.7	3.0	
TPC Biomass Cogen (Arusha)	TPCL	18.0	1,200	36.0	10.0	
Mafia Island Biomass Gasification (Coast)	Stanley & Sons	0.4	1,500	2.6		0.4
Kitonga SHP (Iringa)	Kitonga Electric Co		500			
Mbinga-Lupilo SHP (Ruvuma)	Agnes Chipole (Sisters' Mission)		1,200			
Kilombero SHP Mngeta (Morogoro)	Rufiji Basin Development Authority	0.4	300	0.3	0.4	
Mwonga SHP (Kigoma)	Kasulu District Council	0.3				
Nakatuta SHP (Ruvuma)		9.2		31.0		9.2
Mzovwer SHP (Rukwa)		3.0		13.0		
Sunda Falls SHP (Ruvuma)		3.0		11.0		3.0

Msofe (2010)

1

Pinyinyi SHP (Arusha)		2.8		11.0		2.8
Lugarawa SHP-MG (Iringa)	Njombe Roman Catholic Church	1.0	500	0.5		
Mavanga SHP-MG (Iringa)	Njombe Roman Catholic Church	1.5	200	1.7		
TOTAL		**47.2**	**7,900**	**127.4**	**23.4**	**15.4**

Notes:
1. SHP: Small Hydro Power Project; MG: Mini-Grid
2. Existing and new installed capacity; Capacity for grid-connected as well as mini-grids
3. Figures according to latest documentation on file
4. REA/TEDAP contribution: US$500 per connection

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CHAPTER

VII

Lessons and Recommendations

REFiTs have the potential to transform not only energy systems but societies in general. When tailored to the local context, they can successfully increase overall energy production both on and off the grid, boost economic development and improve access to clean energy for all - while avoiding the emission of green house gases and other problems related to dirty development. Moreover, the decentralized approach of REFiTs allows for alternative ownership and governance models and provides the opportunity to empower communities as well as refreshing local democracy and self-governance. However, if the costs for the policy are recuperated solely by raising energy prices for the end consumer, there is a risk of further excluding the poor from development opportunities.

To achieve their potential, REFiTs should not be seen as an isolated policy for the energy sector, but as an integral part of a country's overall development strategy. It is important to keep this in mind during the whole process, from the first debates to the technical design of the REFiT policy and of course its implementation.

The countries covered in this book may all hail from the same continent, but there is a great deal of difference between them. The case studies include a small-island state dependent on fuel imports (Mauritius), the continent's biggest carbon polluter who is facing international pressure to reduce it emissions (South Africa), countries with less than 3% rural electrification (Tanzania), and others with almost universal access to electricity (Egypt and Algeria). This means each will have different motivations for introducing a REFiT, as well as expecting distinct outcomes. However, by looking across all countries and how they came to introduce the REFiT, how it has been designed and what is both helping and hindering it to achieve its goals, it is possible to draw broader lessons and make recommendations for African countries who do not yet have a REFiT. This chapter is also useful for those countries who already have REFiTs, because – as this book has shown – they are an evolving, flexible policy tool that can match the changing needs of policy makers. A special section shows how REFiTs can benefit and empower communities and the poor, particularly in rural areas, as well as a closer look at different ways that international sources of finance can boost the REFiT.

BUILDING MOMENTUM FOR THE REFIT

There are many reasons for introducing a REFiT. Some countries like Ethiopia are interested in exporting renewable energy, while others like Algeria see it as a way to reduce their domestic consumption of fossil fuels. For many it is a path to economic development, through creating new green industries, jobs and a steady supply of electricity to the rural and urban population. External pressure, both of actors and events, reinforces these points. The influence of international organisations (e.g. the World Bank and UN bodies), donors and Civil Society Organisations in encouraging, guiding and supporting countries' move towards the REFiT has seen its widespread uptake. That the policy is tried and tested across the global North and South has added weight to their words. The other main driver, in over three quarters of countries surveyed, was an energy crisis in the form of unreliable or unaffordable generation. In Southern and Eastern Africa, the 2004-2006 drought undermined the reliability of large hydro and left countries scrambling for costly emergency diesel generators and chronic load shedding. The 2006 oil crisis left many countries, including import-dependent Mauritius, suffering further, meaning finding an alternative was imperative. Social and economic development depend on reliable and affordable electricity. Climate change is predicted to increasing the frequency and severity of droughts across the continent, while the outstripping of oil supply by demand will continue to push up oil prices. Therefore, along with the benefits covered in chapter I, there is increasing motivation for African countries to adopt a REFiT and increase domestic production of renewable energy as part of a just transition towards a low carbon future.

External motivation is often not enough for policy makers to introduce a REFiT, as it also depends on the right balance of forces within a country. Political will and support at the highest level is very important to overcome internal barriers such as vested interests of the current power producers. In Ethiopia, the lack of enthusiasm has kept the policy under revision in draft format for four years, while in Egypt and South Africa the REFiT has been sidelined in favour of a bidding process. In contrast, the REFiT in Botswana, Mauritius, Rwanda and Tanzania enjoyed high levels of political buy-in, also because it is part of a wider government development strategy to ensure it is seen as integral rather than additional to any plan. This approach also ensures that the policy is not dependent on individuals, thus reducing the potential threat to policy continuity in case of a change in government.

A lack of detailed knowledge about renewable energy technologies and REFiTs among stakeholders has proven a serious obstacle in most countries. In Tanzania, the World Bank overcame widespread scepticism by taking policy makers, utilities, regulators, financiers and project developers on a study trip to Sri Lanka and Thailand to see how their REFiTs functioned. Learning from others' experiences through South-South exchanges can bring utilities, regulators and other actors on board, which supportive international donors should facilitate. A dedicated team within the utility can also provide practical evidence that a REFiT is possible, thus helping to overcome internal barriers and ensuring a streamlined process for developers.

DESIGNING THE POLICY: GETTING THE PROCESS RIGHT

Securing enough support for the introduction of the REFiT is an important step, but the design process will determine what the policy looks like and to what extent it addresses the energy and development needs of the whole country, including the energy poor. While the private sector was usually invited to participate in the development of a REFiT policy, civil society representatives and their efforts to include the interests of communities and the energy poor were sidelined in many countries. However, this has proven a short-sighted approach. First, exclusion of communities and the energy poor means that their knowledge of conditions on the ground cannot be considered during the discussions, thus raising the risk of inappropriate policy design. Second, lack of public support can undermine the success of even the best policies. In South Africa, a broad base of domestic support made all the difference, overcoming utility and ministry opposition to introduce the original REFiT (though it was later abandoned in favour of a bidding process). Broad coalitions of civil society, supportive politicians and the private sector pushing for the introduction of a REFiT are most successful in overcoming obstacles and reaching a more balanced policy with maximum impact.

DESIGNING THE POLICY: GETTING THE CONTENTS RIGHT

The overall aims of a country's energy policy, i.e. fast growth of generation capacity or increased access to electricity in rural areas, have a big influence on the design of a REFiT – or even the question whether a REFiT is the right option. Where building large-scale renewable energy plants are a priority, several countries have opted for bidding processes. In other cases, where the aim was to democratise electricity production and to reduce demand from the grid, a REFiT policy with net metering was adopted. Countries looking to stimulate smaller projects have also introduced differentiated tariffs, which ensures that smaller installations are also feasible.

A bidding process may be more appropriate for larger-scale projects as a way of driving down costs. However, South Africa's oversubscribed policy also shows that a bidding process can limit ambition while cost reductions can be at the expense of wider socio-economic benefits. If bidding is considered for larger projects, it must be part of an integrated strategy with a special emphasis placed on socio-economic development.

Net metering and differentiated tariffs should be key considerations for any REFiT policy as they allow smaller, local producers to be involved. This can have many positive aspects. As well as supporting small-scale generators, production and consumption of electricity at a local level reduces the demand from the national grid and thus frees up capacity for productive uses while improving energy access for all. These approaches also encourage investment that would not be considered profitable enough for larger or international investors, thus leading to faster and more regionally equitable growth of energy production.

As Namibia has demonstrated, it is also possible to adopt a mix of approaches: net metering at the household and community level; a traditional REFiT for small power producers up to 10MW; and a bidding process for the larger projects.

In the context of low levels of electrification and limited reach of the national grid, REFiT policies should include support mechanisms for off-grid solutions. Tanzania for example has established a mini-grid programme that has the potential to propel progress in expanding access to electricity in rural areas and stimulate local economic development. Provisions should be made to encourage and support local ownership structures, as experience shows that mini-grids owned and managed by communities can allow far higher levels of local participation and development.

Tariff levels and cost recovery

A key determinant to the success of the REFiT in attracting project developers and investors of all sizes is, of course, the tariff, which incorporates both the level and duration of payment. Tariffs based on the avoided cost methodology have been chosen by governments to avoid a rise in electricity prices. It is also far easier to calculate and thus helps speed up the introduction of the policy. However, as stakeholders have pointed out in Algeria, Kenya and Uganda, low tariffs do not encourage significant stakeholder investment and are only acceptable for very large projects that can benefit from economies of scale, or cost-competitive technologies such as hydro, thus hampering a healthy mix of technologies. A tariff based on the actual cost of generation allows developers to chose more expensive, but possibly more appropriate technologies. Interestingly, the utility in Rwanda found that a tariff based on cost of generation was actually cheaper than an avoided cost calculation if a broader cost-benefit analysis is undertaken (see Chapter III).

The choice of a tariff structure should be based on a holistic and long-term analysis and allow for creative solutions. Uganda is considering front-loaded tariffs, whereby the tariff is higher for the first few years and then drops to a lower level. This approach supports projects with high levels of initial investments, without increasing the long-term costs for the utility.

Cost sharing

Where a REFiT does incur additional costs to the status quo, these are traditionally passed on to the end consumer. As this may have negative consequences on policy goals such as increased energy access in countries with a high level of poverty, many countries have found innovative ways of protecting poorer customers. This will be particularly important as World Bank/IMF programmes of market liberalisation continue to push to remove consumer subsidies and raise the price of electricity. While Ghana has announced as-yet-unspecified plans for a social transfer mechanism, South Africa already provides a monthly quota of free electricity to low-income households (although the current quota of 50 kWh per month is criticised as too low). Another option is to cross-subsidise low-income households through higher tariffs for rich customers. Such tariff structures are already in place in Kenya and Ethiopia, which operates a tiered pricing scheme with very low prices for low consumption. Namibia is considering introducing a similar policy.

However, given the relatively small middle class in most African countries, even cross-subsidies may not be able to coverall the costs of a REFiT.

Thus, additional sources of funding may also be necessary to protect the poor from higher prices. Algeria and Mauritius have both taxed fossil fuels in order to fund renewable energy. Meanwhile Ghana and Uganda are looking to international climate finance to support their REFiT programmes, such as through Nationally Appropriate Mitigation Actions (NAMAs) under the UNFCCC and the newly-created but still ambiguous Green Climate Fund, expected to become operational soon.

However, so far the hopes set in international climate funding have not been fulfilled. Support for NAMAs remains elusive and trading of carbon certificates through Clean Development Mechanism has neither delivered finance for new projects, nor the promised carbon savings. As these sources are unlikely to provide the required funds, new and innovative sources should be developed to provide the 'premium' for African REFiTs:

- A tiny Financial Transaction Tax (FTT) on risky and speculative trades in currency, stocks and derivatives could raise up to $650 billion per year and is already supported by the G20, with the IMF saying it is technically feasible.
- The IMF could use Special Drawing Rights - its own 'synthetic currency' – to make available funding for renewable energies.[1] This mechanism was successfully tested to provide extra liquidity and credit-worthiness to the banking sector during the financial crisis.
- Redirecting fossil fuel subsidies away from oil producers could generate up to $100 billion per year for climate finance.[2]
- A levy on aviation and shipping could produce considerable extra funds, as well as reducing the emissions from two high-polluting industries. Shipping alone could raise $10 billion.[3]

The funds raised through these mechanisms should be channelled through a global fund for feed-in tariffs[4], which would provide the extra premium needed, act as a guarantor and provide technical assistance and expertise.

Grid issues

Many countries have decided to limit the total capacity of newly installed RE power plants under their REFiTs because of the poor quality and limited size of the grid. Grid improvement can increase efficiency, reduce

1 World Future Council (2011) Financing climate protection with newly created SDRs, http://worldfuturecouncil.org/climate_finance.html; ActionAid (2010) Using Special Drawing Rights for Climate Finance, Discussion Paper

2 Oil Change International (2012) No Time to Waste: The Urgent Need for Transparency in Fossil Fuel Subsidies, Oil Change International, available at http://priceofoil.org/wp-content/uploads/2012/05/1TFSFIN.pdf

3 Oxfam/WWF (2011) Out of the Bunker: Time for a Fair Deal on Shipping Emissions, Briefing Note.

4 Friends of the Earth (2011) Reclaiming Power: An energy model for people and the planet, FoE, London

load shedding and balance intermittent renewable technologies. Given the expected growth in energy demand, many state-owned utilities are planning expensive grid expansions. Often, a more cost effective alternative is to encourage small power producers (SPPs) to set up mini-grids that can work independently in remote areas and be integrated into the national grid at a later stage. SPP-friendly tariffs also lead to a more diversified and resilient supply.

CREATING AN ENABLING ENVIRONMENT

Simplifying the process

Another key determinant of REFiT success is the quality of the administrative process of becoming a fully operational power producer under the policy, including questions of licensing and grid integration. In countries without standardised PPAs, project developers have experienced long, drawn-out negotiations adding extra cost and uncertainty to the process, taking up to two years in Kenya and as many as four in Uganda. High costs for feasibility studies as well as uncertainties about who pays for connecting new plants to the grid or who purchases the electricity have caused additional delays.

The introduction of standardised feasibility templates and PPAs has successfully reduced red tape. A lead agency as point of contact and clear guidelines for the overall process, as practised by Mauritius, should also be considered to speed-up project implementation.

Furthermore, governments and state-owned utilities can easily help lower the costs for individual project development by providing detailed information on the country's renewable energy potential. The publication of a national solar and wind atlases, which international agencies and donors have already helped produce for some countries, informs potential investors about suitable areas and reduces the costs for feasibility studies.

Land Issues

As with all development projects, disputes over land – who owns it, who uses it, who has the right to develop it - have also occurred with renewable energy projects. Forced displacements and the destruction of ecosystems in connection with large hydropower projects are well documented, and the existing competition over agricultural land for is likely to be exacerbated by the demand for building sites for renewable energy plants . Any potential developments must engage communities using the land and ensure their concerns and rights are respected. All transactions need to be transparent and accountable, with adequate support given to those affected.

Providing access to finance

Accessing project finance has been a recurring barrier in all countries surveyed. National banks regard investment in renewable energy as risky and are only offering high interest loans with short payback times. These problems are critical for developers who rely on local finance, in particular smaller, community-based projects. Improving the capacity of local banking institutions is important, as is raising their confidence in the REFiT policy through building up a proven track record of timely payments by the utility. PPAs would then be seen as credible guarantees and facilitate longer-term loans at affordable interest rates. If PPAs are not accepted due to liquidity problems of the utility, creditworthy governments or international institutions should provide additional guarantees.

In many of the countries surveyed, multilateral development banks and international donors already provide specific low-interest credit lines for renewable projects. However as the money passes through regional banks and financial intermediaries before reaching local banks, accumulative interest is added, resulting in higher borrowing for the developer. Governments and international financial institutions need to ensure the low rates of borrowing are passed on to project developers. International concessional finance and grants are vital in supporting the high costs for local project developers, but are most effective when directed through government agencies rather than commercial banks.

In Algeria, a levy on fossil fuel exports is used to provide state support for renewable energy projects. The private sector can also take a role. In Kenya for example, the government has joined with the international insurance company MunichRE to insure the risky start-up costs of a geothermal plant. Without government involvement, the Kenyan Association of Manufacturers has established a fund to provide support for its members who want to invest in renewable energy projects. All of these approaches could be replicated in other countries.

Local Awareness and Technical Capacity

Insufficient information about renewable energy technologies as well as the details of a REFiT scheme are serious threats to the policy's overall success. Eligible groups may be excluded through ignorance, while misjudged risks can lead to rejection of funding as well as unexpected costs and negative experiences with sub-standard technology may lead to severe social acceptance barriers. Dissemination of information and success stories is of crucial importance. Governments and utilities should therefore invest in pilot projects or equip public buildings like schools and hospitals with RE technologies to provide and publicise proof of concepts to large audiences.

The lack of local technical capacity is a related problem. The resulting need to import both technology and skilled labour leads to an increase in overall project costs. This has made it particularly difficult for smaller developers who either cannot realise their projects or have to revert to low quality products. Poor installations and maintenance, however, undermine confidence in the new technology and thus pose a risk to the overall success of a REFiT policy.

Building local capacity and supply chains is a necessary condition not only to reduce costs, but also plays an important role in general economic growth and job creation. REFiTs should be designed to stimulate demand for local skills and capacity, i.e. through local ownership laws or local content requirements.[5] As long as foreign expertise is still needed, international developers should be also obliged to transfer skills and technical capacity.

UNLOCKING THE FULL POTENTIAL: INTEGRATING THE REFIT IN THE WIDER DEVELOPMENT STRATEGY

More than just a way to increase the production of sustainable electricity, REFiTs can be an effective tool for promoting rural development and tackling poverty. In order to fully unlock this potential, the REFiT should be fully integrated into a country's wider development strategy. As discussed above, the renewable energy sector needs skilled labour and a reliable support industry. These requirements must be included in the national plans for education and vocational training as well as a broader industrial development strategy. Thus, the introduction of a well-integrated REFiT will have positive spill-over effects on other sectors and serve as on important springboard to leapfrog dirty industries and embark on a direct transition towards a low carbon future.

REFiT programmes should also be integrated with rural development and poverty eradication strategies. Making reliable electricity available through REFiTs can provide a much-needed boost for rural economies. Moreover, decentralized energy production will itself provide employment and strengthen the local tax base. The greatest

5 The World Trade Organisation has disputed local content requirements in some countries.

local benefit comes from a high degree of local ownership (see chapter V). Policies should thus support local ownership structures such as cooperatives and provide capacity building on business planning.

Thus, the introduction of a well-integrated REFiT will have positive spill-over effects on other sectors and serve as an important springboard to leapfrog dirty industries and embark on a just transition towards a low carbon future.

ACRONYMS

BBBEE	Broad-Based Black Economic Empowerment
BOOT	Build, Own, Operate, Transfer
BIPV	Building-Integrated PV Installations
CEB	Central Electricity Board
CERs	Certified Emission Reductions
CSP	Concentrated Solar Power - sometimes also called “solar thermal” in the context of large power plants
DoE	Department of Energy
DME	Department of Minerals and Energy
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
DSO	Distribution System Operator
EAPP	Eastern Africa Power Pool
EDPRS	Economic Development and Poverty Reduction Strategy
EETC	Egyptian Electricity Transmission Company
ECB	Electricity Control Board
ERC	Energy Regulatory Commission
EWSA	Energy, Water and Sanitation Authority
EIA	Environmental Impact Assessment
EEPCo	Ethiopian Electric Power Corporation
EEA	Ethiopian Electricity Agency
EU-EI	EU Energy Initiative
FiT	Feed-in Tariff
GW	Gigawatt
GWh	Gigawatt hour
GEF	Global Environmental Facility
GoB	Government of Botswana
GHGs	Greenhouse Gases
IPP	Independent Power Producer
IRR	Internal Rate of Return
IEA	International Energy Agency
IFC	International Finance Corporation
KenGen	Kenya Electricity Generation Company Limited
KPLC	Kenya Power
KTDA	Kenya Tea Development Association
kW	kilowatt
kWh	kilowatt-hour
LCOE	Levelised Cost of Electricity
MAN	Manufacturer’s Association of Nigeria
MID	Maurice Ile Durable
MIDF	Maurice Ile Durable Fund
MW	Megawatt
MWh	Megawatt-hour
MWp	Megawatt-peak
MENA	Middle East and North Africa
BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)
MININFRA	Ministry for Infrastructure
MoE	Ministry of Energy
MME	Ministry of Mines and Energy
NERSA	National Energy Regulator of South Africa
NAMAs	Nationally Appropriate Mitigation Actions
NREA	New and Renewable Energy Authority
NERC	Nigerian Electricity Regulatory Commission
NGO	Non-governmental Organisation
PV	Photovoltaic
PPA	Power Purchase Agreement
RE	Renewable Energy
REFiT	Renewable Energy Feed-in Tariff
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
REA	Rural Electrification Agency
REF	Rural Electrification Fund
RURA	Rwanda Utilities Regulatory Agency
SPP	Small Power Producer
SHS	Solar Home System
SPS	Solar Pico System
TSO	Transmission System Operator
SE4ALL	UN Secretary General’s Sustainable Energy for All initiative
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organisation

GLOSSARY

Avoided Costs: In this case, a financial model used to calculate tariffs of a REFiT. It is based on costs a utility avoids by purchasing electricity from another producer (IPP) instead of building a new plant.

Cogeneration: Use of waste heat from electricity generation for other productive use (e.g. in the form of steam turbines for additional electricity, steam/heat for industrial processes, pasteurization, cooling, etc).

Cost Recovery: Refers to how the incremental costs of the policy are allocated.

Crowdfunding: Crowdfunding is a way of financing a project via many individuals who network and pool their resources.

Curtailment: Reducing a company's production to run more efficiently.

Degression: A descent by stages or steps. Degression is used to incentivize reductions in the cost of production--through technology innovations or market saturation.

Economies of scale: A reduction in unit cost due to expansion. If economies of scale apply, a higher production reduces the costs per produced unit.

Electricity Banking: A contractual system in which generated electricity (from renewables) can be stored in the grid, to be used later. This occurs for example when the produced electricity is higher than the demand. For example a household using a hydro plant for onsite use can sell the excess power to the grid during high season and buy it back later for the same price plus a fee for use during low season.

Embedded generator: Small-scale power plants connected at the distribution (not transmission) level/voltage and which are not controllable or monitored by the grid system operator.

Financial close/closure: When all the financing, approvals and other requirements for a project have been secured and the project is ready to proceed to construction under a "project finance" or "non-recourse" approach (the standard private sector approach) to building infrastructure projects.

Generation Cost: Financial model used to calculate tariffs. The model is based on the actual or assumed costs of a certain technology with a specific size to produce one kWh. The tariff usually is set higher than the generation costs to provide additional returns for the investors.

Greenfield Investment: In the context of energy, Greenfield Investments describe the investment in a power project in an area where no prior projects exists. For example in Mauritius the REFiT does not allow for greenfield investments. Only existing electricity users are allowed to participate under the REFiT. - See Mauritius (Chapter III) for more information.

Hybrid/hybridization: The application of two distinct technologies types in one power plant, normally a thermal/solar or thermal/wind combination.

Hydro-Scales:

Term	Size	Usage
Large	> 100 MW	Usually a hydro dam connected to a large (national) grid
Medium	10 MW - 100 MW	A hydro dam or river flow connected to a large grid
Small	1 MW - 10 MW	A river flow connected to a grid
Mini	100 kW - 1 MW	Possible to feed into a national or mini-grid or as standalone scheme
Micro	10 kW - 100 kW	Usually provides electricity for a small community or industry in remote areas
Pico	< 10 kW	Usually provides power for a few specific users

Independent Power Producer: An Independent Power Producer is an entity, which is not a public utility, but owns generating facilities that generate electricity for sale to utilities or end-users.

Internal Rate of Return: The rate of return not including environmental factors such as interest rate or inflation.

Levelized Cost of Electricity: Levelized cost is often used to compare the generation costs from different technologies. In particular it represents the per kWh costs of constructing and operating a generating plant over an assumed financial life and duty cycle.

Load shedding: Load shedding, also referred to as rolling blackouts, is an intended shutdown of power supply for a certain period of time over a specific region in the distribution area. Load shedding is very common in many parts of Africa where the installed capacity is insufficient to serve the demand of the whole distribution area.

Local content: A certain percentage of goods and services must be procured from local equipment manufacturers and service providers. - See South Africa (Chapter III) for an example.

Long Run Marginal Cost: Long Run Marginal Costs measure costs of increasing the production by a single unit or the costs saved by reducing the production by a single unit in the long term, taking future investments and a change of capacity into consideration.

Municipal Waste: Also known as trash, garbage or rubbish, Municipal Waste consists of everyday items discarded by the public.

Net metering: A mechanism where users connected to a grid produce electricity and sell net-excess electricity to the grid. The meter usually is installed at the interconnection point between user and grid, thus onsite electricity demand is covered by onsite generation first before excess electricity is exported (sold) to the grid. This is the case if onsite generation is higher than onsite demand. The tariff per kWh for exported electricity to the grid usually is higher than the utility price to incentivize users and cover their investment into renewables. If generation is lower than electricity demand, the user covers the remaining demand from the grid and pays for every kWh to the utility. - See Mauritius (Chapter III) for an example.

Offtaker: Refers to the electricity buyer.

Power Purchase Agreement: The contract between a power producer looking to sell electricity from a generating plant (seller) and the offtaker who wants to purchase the electricity (buyer). A PPA can be standardized or non-standardized and includes all important terms between the two parties. Thus a PPA is a crucial part for project finance.

Premium cost/premium tariff: Any additional compensation payable above a base tariff or base rate.

Rate of return: The ratio of money gained or lost on an investment relative to the amount of money invested.

Solar PV: PV stands for Photovoltaic and is a method to generate electricity by solar radiation into direct current (DC) electricity. The output DC electricity usually is converted to alternating current (AC) to be used for most electronic devices.

Unbundling: When in an institutional context it is the separation of integrated organizations into separate legal entities with a more specialized focus. In the electricity sector, this usually refers to the generation, transmission and distribution (and sometimes system operation) functions of a state or private utility being separated.

UN Clean Development Mechanism (CDM): The Clean Development Mechanism was developed as part of the 1997 Kyoto Protocol. CDM allows projects that reduce greenhouse gases (GHGs) in developing nations to earn Certified Emission Reductions (CERs) for each ton of CO2-equivalent of GHG reduced.

World Future Council

The World Future Council consists of up to 50 respected personalities from all five continents. They come from governments, parliaments, the arts, civil society, science and business. Together they form a global voice highlighting our responsibilities as citizens of the earth, speaking up for the needs and rights of people and planet. The World Future Council head office is in Hamburg, Germany, with additional staff working from Johannesburg, Geneva and London.

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HEINRICH BÖLL STIFTUNG

The Heinrich Böll Foundation, associated with the German Green Party, is a legally autonomous and intellectually open political foundation. Our foremost task is civic education in Germany and abroad with the aim of promoting informed democratic opinion, socio-political commitment and mutual understanding. In addition the Heinrich Böll Foundation supports artistic and cultural as well as scholarly projects, and co-operation in the development field. The political values of ecology, democracy, gender democracy, solidarity and nonviolence are our chief points of reference. Heinrich Böll's belief in and promotion of citizen participation in politics is the model for the foundation's work.

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