The Role of Feed-in Tariff Policy in Renewable Energy Development in Developing Countries: A Toolkit for Parliamentarians

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1.0 Introduction

1.1 What is a Feed-In Tariff?

A feed-in tariff (FiT) is a policy instrument used to encourage the growth of an industry in renewable energy generation by ensuring that those who produce electricity from solar, wind and other renewable sources have a guaranteed market for the electricity they produce, and therefore a return from their investment. FiTs oblige the energy companies (or 'utilities') responsible for operating the national grid to purchase electricity from renewable energy sources at a pre-determined price which is sufficiently attractive to stimulate new investment in the renewables sector. These renewable energy sources may include wind, biomass, small hydro, solar and wave power. Feed-in tariffs are an important policy incentive for promoting renewables since they enhance investor confidence by removing uncertainties regarding the selling price of electricity to the national grid.

In summary, the key objectives of the FiTs are to:

- Facilitate resource mobilisation by providing investment security and market stability for investors in renewable energy sources,
- Reduce transaction and administrative costs by eliminating conventional bidding or negotiation processes,
- Encourage private investors to operate power plants prudently and efficiently so as to maximise returns.

1.2 Benefits of feed-in tariff policies

Feed-in tariffs have been implemented with impressive results in Mauritius, Nepal, Sri Lanka and Kenya. They have stimulated interest in renewable energy development in Uganda, South Africa and Tanzania. Led by Germany, Denmark and Spain, a growing number of industrialized countries are aggressively promoting renewables using the feed-in tariff model.

FiTs have proven to be effective policy instruments in overcoming a key long-term barrier to introducing renewable energy and making it economically viable. They provide guarantees attractive to investors, including access to the grid, long term power purchase agreements and a set price per kilowatt hour (kWh) that covers the costs associated with electricity production.

In brief, the key benefits of feed-in tariffs include:

- If well structured, ensuring that all electricity produced from renewable sources has a guaranteed buyer by obliging grid operators and utilities to purchase the electricity and by giving priority to access the national grid.
- Providing incentives for investors, who are assured of a market and return on their investment;

- Assisting in establishing a secure environment for the financing of renewable energy projects, and promoting market stability for investors in renewable energy electricity generation;

- Accelerating implementation of renewable energy projects.

2 Building a Successful Model for Feed-in Tariff Policy in Developing Countries: the example of Kenya

2.1 Background on the development of FiT policy in Kenya

The Government of Kenya recognised that renewable energy sources including solar, wind, small hydro, biogas and municipal waste energy have potential for income and employment generation in addition to contributing to the supply and diversification of electricity generation sources. Sessional Paper No. 4 of 2004 on Energy incorporates strategies to promote the contributions of other renewable energy sources in the generation of electricity (MoE, 2008).

AFREPREN/FWD was instrumental in the submission of a feed-in tariff policy for co-generated[1] power in Kenya. This was largely a result of intensive lobbying for inclusion of FiTs in the Ministry of Energy's annual performance targets. Subsequently, the Ministry of Energy published a Feed-in Tariffs policy with associated regulatory measures and price incentives for biomass-based cogeneration, wind and small hydro in the first half of 2008.

The MoE prepared a Position Paper in the Financial Year 2007/08 proposing to establish a feed-in tariff policy for electricity generated from renewable energy sources - wind, biomass and small hydro. The Ministry of Energy and other stakeholders convened a Consultative Meeting which attracted development partners like the World Bank. This Consultative Meeting was followed up by a Cabinet Meeting to discuss how Kenya could increase its electricity generation using its vast biomass resources which is commonly found in the major sugar industry as well as attract investments in the wind and small hydro sub-sectors. The Government of Kenya financed the development of the Feed-in Tariff policy. The Feed-in Tariff policy stipulates the price that Kenya Power and Lighting Company Limited – the singer buyer - should buy the electricity generated from renewables. The Feed-in Tariff policy has limited financing implications as it does not imply direct subsidies.

It was agreed that private companies and small and medium enterprises can be encouraged to venture into electricity generation through favourable feed-in tariffs. To adopt an already tested and confirmed successful model of the feed-in tariff policy, several drafts were considered: Nepal, Sri Lanka, Germany and South Africa. On completion, the draft feed-in tariff policy document was submitted to the Treasury for approval and later gazetted by the Ministry of Energy (Mbuthi, Per.Comm. 2008). It is noteworthy to mention that AFREPREN/FWD was also instrumental in the identification of model feed-in tariff policies.

The policy is expected to boost exploitation of abundant local renewable energy sources in the country by attracting private sector capital investments in renewables. The policy document

[1] Cogeneration is the simultaneous production of two different forms of energy, heat and power, from a single energy system. It is also known as combined heat and power (CHP), see the figure in Annex 1.

defines the maximum feed-in tariffs (see Table 4) for both firm[2] electricity generation and non-firm[3] power, with a more attractive tariff offered for firm power.

Table 3: Feed-in Tariffs Kenya

Source	Power plant effective generation capacity (MW)	Firm power Tariff (c/kWh)	Non firm power tariff (c/kWh)	Generation capacity caps	PPA Duration (years)
Small hydro	<1	12.0	10.0	First 100MW of firm power First 50MW of non firm power)	15
	1-5	10.0	8.0		
	5-10	8.0	6.0		
Wind	<50	9.0	-	150 MW	15
Biomass	<40	7.0	4.5	First 150MW of firm Power) First 50MW of non-firm power)	15

Source: MoE, 2008

It can be argued that the feed-in tariff policy is well integrated into power planning, as a total of 500 MW have been earmarked for development under the feed-in tariff policy as follows (MoE, 2008):

- 100MW of firm small hydro power
- 50MW of non-firm small hydro power
- 150MW of wind power
- 150MW of firm biomass-based cogeneration power
- 50MW of non-firm biomass-based cogeneration power

However, while the amount of planned renewable energy development under the FiT policy is significant (about 42% of current national installed capacity), the legal status of the FiT Policy jeopardizes the realization of the 500 MW of renewable energy. This is because a policy does not enjoy the same level of protection that an Act of Parliament enjoys. Unlike an Act of Parliament, if a policy does not have significant political support, it could be changed, put on hold or scrapped altogether. Therefore, the Feed-in Tariff Policy should be transformed into an Act of Parliament to ensure that any changes to its original intentions and design are only made after a significant amount of scrutiny and deliberations in Parliament.

There are other benefits of having an Act of Parliament on FiTs. For example, this can provide power purchase agreements with a strong legal backing on the basis that the salient features of PPAs shall be outlined in the Act. Furthermore, as a policy, it is not clear whether or not another set of FiTs shall be stipulated if the planned 500 MW are realized – will the FiT Policy cease to exist? This is an important lesson for other developing countries planning to implement FiTs.

Impacts of FiT Policy in Kenya

The Kenyan feed-in tariff Policy is only a few months old and it is, therefore, too early to measure its success. However, it has significant potential for impacting on the following areas:

- Providing additional renewables-based generation capacity to the country;
- Enhancing employment and poverty alleviation in the rural areas;
- Increasing income opportunities for business development.

The following section discusses the aforementioned impacts in Kenya:

[2] Producing electricity throughout the year.
[3] Producing electricity intermittently i.e. when there is excess electricity for sale to the grid

2.2.1 Additional generation capacity

As mentioned earlier, it is expected that the FiT policy in Kenya could stimulate about 500 MW of electricity generation capacity. This represents about 42% of the current installed capacity on the national grid - a significant amount indeed. If the projected generation capacity is realised, this could contribute significantly to ensuring security of electricity supply in the country by increasing the reserve margin. Furthermore, since the resources utilised consist of relatively low-cost local fuels, it is likely to reduce costs for the consumer.

News emanating from the Ministry of Energy indicate that, following publication of the FiT Policy, a total of seven Expressions of Interest (EOI) have been received by the Ministry (Magambo Per.Comm., 2008). In addition, many sugar factories are in the process of upgrading their biomass-based cogeneration potential (or have such plans underway) in order to capture the benefits presented by the FiT Policy. For example, Mumias Sugar Company – a leading sugar factory – has expanded its biomass-based cogeneration facility from 15MW to 35MW. It has already secured a ten-year power purchase agreement at about US Cents 6.0 per kWh.

Biomass-based cogeneration – as well as wind and small hydro – offer more diversified sources of renewable power, thus providing protection against unstable and high oil prices as well as drought- induced large hydro-power crises. Mauritius - which generates about half of its electricity from biomass-based cogeneration – provides evidence that oil-importing countries such as Kenya can reduce their oil import bills by promoting renewable energy development through favourable feed-in tariff policies.

2.2.2 Enhancing Employment and Poverty Alleviation in the Rural Areas

Invariably, the locations with the most promising renewable energy potential are in rural areas. Therefore, promotion of renewable energy development through FiT Policy in Kenya could lead to direct benefits among the rural poor. For example, the construction of power plants requires a significant proportion of casual labour which is readily available in rural areas. Existing studies indicate that, in comparison to other primary energy sources, the job generation potential of modern biomass such as cogeneration is among the highest as shown in the following table.

Comparison of Job Creation – Biomass and Conventional Energy Forms

Sector	Jobs (person-years per Terawatt-hour)
Petroleum	260
Offshore oil	265
Natural gas	250
Coal	370
Nuclear	75
Wood energy	**1,000**
Sugarcane cogeneration	**4,000**

Source: Goldemberg, 2003

The development of the renewable energy resources that are linked to agro-industries could also enhance employment among the rural poor. For instance, expanded cogeneration development implies increased demand for sugarcane.

Consequently, there is increased acreage of land on which sugarcane is grown, requiring more labour to be employed, as sugarcane cultivation is a labour-intensive activity. It is estimated that between five and six million people either directly or indirectly benefit from the sugar factories.

The sugar factories have directly and indirectly contributed to job creation by supporting about 200,000 small scale farmers within the sugar belt in western Kenya.

2.2.3 Increased Opportunities for Rural Business Development

The installation of renewable energy-based power plants (cogeneration, small hydro and wind) can have immediate impacts on the local population. For example, the electricity generated from the power plant can be supplied within the locality. Thus, pursuing a policy of supporting renewables-based power generation naturally extends the reach of the national grid into hitherto off-grid areas. This leads to a wider range of higher-value activities (e.g. dairy farming, fishing, welding, etc) that local residents can engage in, thereby promoting income generation.

3.0 Model Feed-in Tariff Policies from other Developing Countries

The following section will briefly discuss FiT policies in other developing countries in Africa and Asia.

a) Mauritius

Mauritius has, over a period of nearly two decades, developed a feed-in pricing policy on co-generated power, which has been the key driver for increased production of bagasse co-generated power.

The development of a feed-in tariff in Mauritius was as a result of close collaboration between policy makers, the sugar industry and other stakeholders. The Government played a key role as the "honest broker" in the negotiation of power purchase agreements and the setting of feed-in tariff levels. This reduced the lengthy and sometimes acrimonious tariff negotiations between investors and the national utility (Deepchand, 2003). The development of tariffs and policies were funded by the Government of Mauritius. The Feed-in Tariffs specify the price at which the Central Electricity Board (CEB) – the single buyer- should purchase electricity from Independent Power Producers in the sugar industry on various power modes.

Table 2 below shows the resulting energy pricing for cogeneration in Mauritius between 1982 and 2000. As the table suggests, developments in energy pricing began at modest levels but grew overtime in order to attract firm cogeneration capacity power plants.

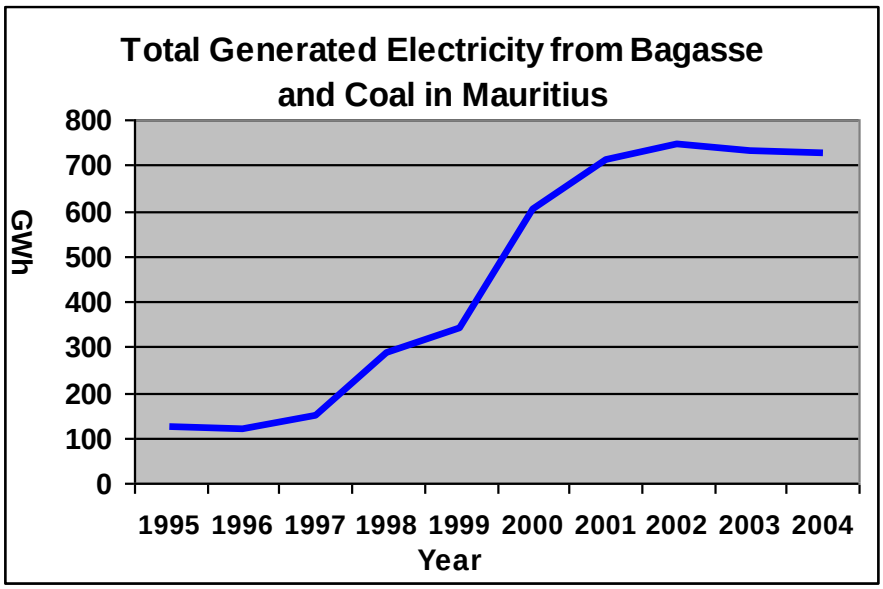
Table 2: Energy Pricing in Mauritius

Power mode	Power Plant	Price – Rs (us ¢)/kWh	Year	Characteristics
Intermittent	-	0.16 (0.6)	1982	Price frozen since 1982
Continuous	Medine	0.55 (1.9)	1982	No change in price since 1982 – no changes brought to the plant
Continuous	6 PPs	1.05 (3.7)	1997	44% of kWh price indexed to changes in oil price; the other 56% is fixed
		1.40 (4.9)	2000	
Firm	FUEL	coal - 1.63 (5.7) bag. - 1.56 (5.5)	1985	Invested in new equipment Indexed to coal price
Firm	DRBC	coal - 1.53 (5.4) bag. - 1.46 (5.1)	1998	Invested in second hand equipment Indexed to coal price
Firm	CTBV	Both - 1.72 (6.0)	2000	Indexed to coal price, cost of living in Mauritius, foreign exchange rate fluctuations

Source: Deepchand, 2003

As seen in the following figure, the amount of co-generated electricity grew as a result of increased investment in cogeneration following the introduction of attractive feed-in tariffs the late 1990s.

Figure 2: Total Generated Electricity from Bagasse and Coal in Mauritius



Source: MSIRI, 2006

b) South Africa

The National Energy Regulator of South Africa (Nersa) is scheduled to announce Renewable energy feed-in tariff (Refit) in early 2009 (Merwe, 2008). Due to the more expensive cost of generating electricity from renewable sources such as wind, sun and natural gas, the Refit aims to stimulate investment in this sector. Although it is not expected to lower the cost of electricity for the customer (as this usually averages out), it should go some way to subsidising investment in renewable energy generation.

The proposed tariff schedule shows energy pricing of between 50c/kWh and 80c/kWh for all renewable energy generated, including from wind, small hydro, landfill gas, and concentrating solar power. Under the Refit arrangement, the national energy utility, Eskom, is the appointed single buyer for the renewable energy generated, and power purchase agreements should last 15 years. The Department of Minerals and Energy (DME) has set a target of 10,000 GWh of electricity to be generated from renewable energy by 2013. The Refit program is expected to substantially contribute to reaching this target (Merwe, 2008).

The Refit study was commissioned and financed by Nersa in an effort to support renewable energy in South Africa. The tariffs stipulated are the utility (Electricity Supply Commission, ESKOM being the single buyer) should pay for electricity generated from renewables – no subsidies are implied.

c) Sri Lanka

Colonial planters used micro- and mini-hydro plants on tea and rubber plantations in Sri Lanka in the late 1800s and early 1900s, with some 500 plants reported to be functioning at the turn of the century. The grid of the Ceylon Electricity Board (CEB) was extended to the plantations in the 1960s and low prices were offered to factories to encourage them to consume more electricity for their operations, thereby making it more economical to purchase electricity from the grid as opposed to running their own power systems. This resulted in the closing down of most of the micro-hydro plants on the estates. In the 1980s, an increase in grid electricity prices

(a result of increased fuel prices) enhanced interest in reviving some of these plants. Some 60 plants were rehabilitated and began operating in tea estates to reduce electricity bills. These were found to be attractive investments as the costs of rehabilitation were much lower than those of building brand new power installations, and returns on investment from the reduced electricity bills were relatively high.

As part of a programme of liberalisation of the power sector by the Sri Lankan government, in 1996 the Ceylon Electricity Board (CEB) allowed grid-connection of private small hydro (<10 MW) and issued a standard Power Purchase Agreement (PPA) starting in 1997, and revised annually. The feed-in tariff on the PPA was determined by the avoided cost of fuel at the CEB thermal plants and tied to the international price of petroleum fuel. The tariff offered to developers in 2005 was around 6 US cents per kWh for the dry season and 5.3 US cents in the wet season. The tariff was financed by the Sri Lankan government.

Returns on investment were found to be attractive, with typical payback periods of around 3-4 years or less. As a result, a significant amount of investment in small hydropower ensued. Table 2 shows a pipeline of 121 MW of small hydro projects either completed or under construction under the Renewable Energy for Rural Economic Development (RERED) project. As the table clearly shows, the number and capacity of small hydropower plants continued to grow over time, especially due to improved feed-in tariff levels.

Table 1: Small Hydropower Projects Commissioned and under Construction under the RERED in Sri Lanka

Commissioned Year	Number of Projects	Total kW	Average size of projects (kW)
2002	2	1,560	780
2003	2	4,470	2,235
2004	11	33,090	3,008
2005 and WIP	30	81,687	2,722
Total	**45**	**120,816**	**2,685**

WIP = work in progress
Source: RERED, 2008

3 Lessons learnt for policy makers in Africa

Based on the findings of the case study from Kenya as well as model FiT policies from other developing countries in Africa and Asia, the the lessons learnt for consideration by policy makers in developing countries can be summarised thus:

FiT policies and investor confidence: FiT policies appear to be crucial for ensuring investor confidence. This is because comprehensive FiTs policies guarantee:

- A market for all energy generated;
- Pre-determined electricity pricing; and,
- Long term Power Purchase Agreements (PPAs).

Long-term commitment: Long-term commitment is necessary from both the private and public sector: This was a key factor in the development of biomass cogeneration in Mauritius. In Kenya, long-term commitment by the Government is demonstrated by the stipulation of long-term power purchase agreements – a minimum of 15 years.

Income generation: Renewable energy programmes or projects that provide opportunities for income generation have in most cases been successful. This is demonstrated by biomass-based cogeneration in Mauritius and small hydro development in Sri Lanka.

Specialisation: Preference should be given to specialised renewable energy projects with specific focus on a single option. This was true in the case of cogeneration in sugar industry in Mauritius and small hydro in the tea sector in Sri Lanka.

Piggyback principle: Building renewable energy industries around existing networks reduces the cost of setting up a whole new network and facilitates accelerated scale-up. This was the case with small hydropower development in Sri Lanka and cogeneration in Mauritius, where renewable development was built on the thriving sugarcane sector. Cogeneration development in Kenya also appears to follow this approach.

BIBLIOGRAPHY

AFREPREN, 2007. Cogeneration Facility for Africa. Nairobi: AFREPREN/FWD

AFREPREN, 2007. AFREPREN Occasional Paper No. 31: Sustainable Energy & community participation in biomass based cogeneration in Kenya.. Nairobi: AFREPREN/FWD

AFREPREN, 2007. Successful energy policy interventions in Africa. Nairobi: AFREPREN/FWD

AFREPREN/FWD, 2006. Greening the Tea Industry in East Africa. United Nations Environment Programme Global Environment Facility Project Document, Nairobi

Deepchand, K., 2003. Opportunities for Cogeneration in a Reforming African Power Sector. AFREPREN Occasional Paper No. 21. AFREPREN, Nairobi.15th December 2003. Nairobi, Kenya.

ESKOM, 2008. Eskom Holdings Limited. Johannesburg, South Africa. http://www.eskom.co.za/live/

Higgo R., 2007. 60th AMEU Convention. Eskom's Pilot National Cogeneration Project.

Karekezi S. and Kimani J., 2002. "Impact of Power Sector Reform on the Poor" in the Energy Policy Journal – Special Issue, Vol. 30, No. 11-12, Elsevier Science Limited, Oxford.

Magambo, E. 2008. Personal communication. Ministry of Energy, Nairobi.

Mbuthi, 2008. Personal Communication. Ministry of Energy. Nairobi.

MoE, 2008. Feed-in Tariffs Policy on Wind, Biomass, and Small Hydro Resource Generated Electricity. Ministry of Energy, Nairobi, Kenya.

Mauritius Sugar Industry Research Institute (MSIRI), 2006. A presentation on strategy towards enhanced bio-energy production from cane biomass. LJC Autrey, KTKF Kong Win Chang and AF Lau

Nersa, 2009. South Africa Renewable Energy Feed-in Tariff (REFIT), Regulatory Guidelines 26 March 2009. South Africa.

Nersa, 2009. Renewable Energy Feed-in Tariff (REFIT) Guidelines. South Africa.

Odhiambo, A., 2008. State taps cane millers to boost electricity supply. Business Daily, Nation Media Group. Nairobi. 28th October 2008.

RERED, 2008. Status of Grid Connected Projects Approved under RERED & RERED-Additional Financing as at 30 Oct 2008. http://www.energyservices.lk/statistics/disbursement.htm

UNDP, 2009. Bio-Carbon Opportunities in Eastern and Southern Africa – Harnessing Carbon Finance to Promote Sustainable Forestry, Agro-Forestry and Bio-energy: Evaluating Biomass Energy Cogeneration Opportunities and Barriers in Africa – The Case of Bagasse Cogeneration p.179-207, Bagasse Cogeneration in Mauritius: Policy Lessons for Africa Countries, p.208-216.

Veragoo D., 2003. Cogeneration: The Promotion of Renewable Energy and Efficiency in Mauritius. Central Electricity Board: Mauritius. p. 11 (2003).

Merwe, C., 2008. Renewable energy feed-in tariff expected in South Africa by February. South Africa.

For more information or clarification and advice on replicating this idea in your country on feed-in tariff policy development, please contact:

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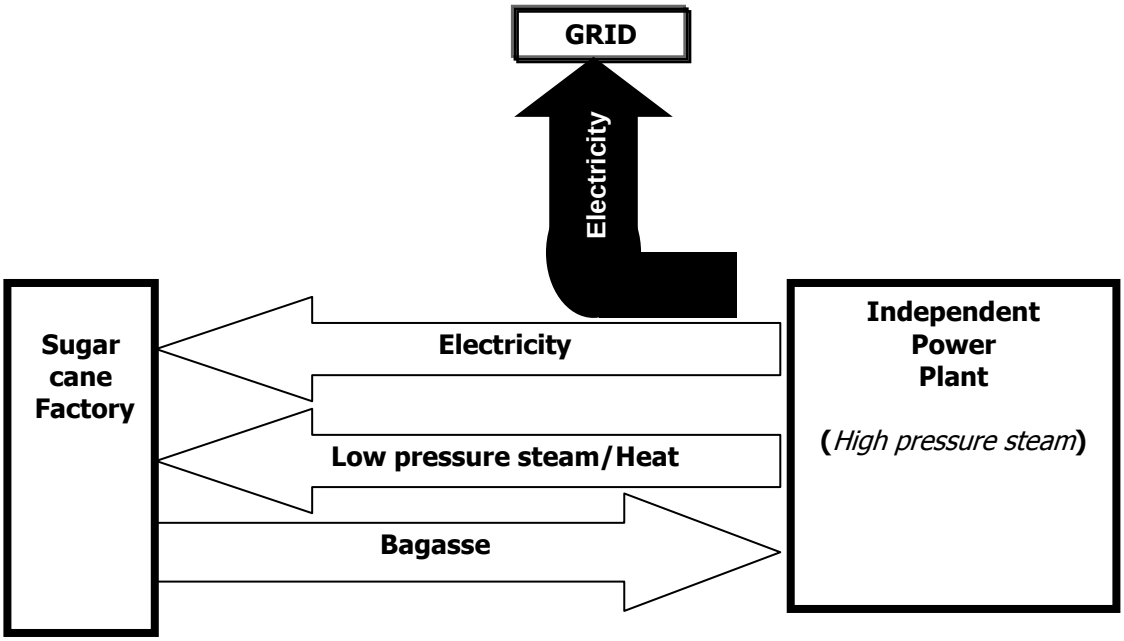
Annex 1: Structure of a simple cogeneration plant



Source: AFREPREN, 2007

Annex 2: Useful links to advice on how the FiT model can be adopted/adapted:

- World Future Council - http://www.worldfuturecouncil.org/arguing_fits.html
- Feed In Tariffs: Frequently Asked Questions - http://www.actionrenewables.org/uploads_documents/SolarcenturyFeedTariffguide.pdf
- Renewable Energy Feed-in Tariffs Community - http://uk.groups.yahoo.com/group/feed_in_tariffs/
- Cogen for Africa - http://cogen.unep.org/