SYNTHESIS REPORT ON RENEWABLE ENERGY

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SYNTHESIS REPORT ON RENEWABLE ENERGY – INTRODUCTORY NOTES

The Mauritius Research Council (MRC) took the initiative to **act as a facilitator** and to **provide a platform** for the main stakeholders in the Energy Sector to open up a dialogue on the promotion of Renewable Energy (RE) sources / technologies for a cleaner and more energy secure Mauritius. In this respect, it organised a two-day workshop on RE on 24&25 July 2006. The overarching aims of this workshop were to:

1. Identify the major players in the RE industry;
2. Identify projects in the field of RE that could be funded by MRC;
3. Identify the barriers to the establishment and growth of a RE industry; and
4. Provide input to the Ministry of Public Utilities for the formulation of a RE Master Plan for the Republic of Mauritius

Please find the list of participants in Annex A.

A Synthesis Report has been written and recommendations have been proposed regarding the promotion of Renewable Energy sources in the Republic of Mauritius based on the presentations and suggestions made by participants. The following provide an overview of the pertinent points that have been addressed in the Synthesis Report:

1. **Sectoral approach** – The recommendations concern the power / electricity sector only. It is proposed that the nation sets a **vision** aiming for **zero dependency on imported fossil fuel** for electricity production beyond 2033**.** Although the transport sector constitutes roughly 50% of Final Energy Consumption, it will be more meaningful to draft separate policies, strategies and action plans for this sector. For this, a more in-depth analysis of the transport sector will have to be undertaken;
2. **A two-pronged approach** – The recommendations for the power sector follows a two stage approach, namely (1) short-to-medium term displacement of oil in electricity generation, and (2) long-term rationale for displacement of coal through novel technologies;
3. **Energy efficiency** – Any attempt to promote RE technologies will have to be done hand-in-hand with substantial efforts to increase energy efficiency of the economy. In fact, energy efficiency may well be the place to start in our envisioning of sustainable use of energy;
4. **Community participation** – RE technologies that allow the generation of electricity at the households/community/municipal levels through Distributed Energy Systems will require the active participation of Civil Society for their successful uptake;
5. **Education** – The adoption of RE technologies and the implementation of energy efficiency measures (at all levels of society) will require attitudinal changes. Education will have a central role to play in facilitating changes in attitudes and mindsets. Another role of education will be in capacity building for the successful deployment of these RE technologies.

1. Synopsis

The proposed recommendations concern the **power sector alone**, and follow from a synthesis of contributions from a wide range of stakeholders, with further input from a technical sub-committee comprised also of selected participants to the workshop.

It is proposed that the nation sets a **vision** aiming **for zero dependency on imported fossil fuel** for electricity production beyond 2033.

The recommendations proposed here for the power sector follow a *two-pronged approach*. The first strategy concerns the displacement of oil in the short-to-medium term, while the second strategy investigates a post-coal era. The implementation of these strategies will be effected through the deployment of a portfolio of Renewable Energy technologies, with **emphasis on Energy Efficiency measures** and community participation, and the investigation of alternative technologies such as biomass gasification for electricity generation in the long-term.

Although large infrastructure investments have already been committed to co-generation and that we may expect "coal as a necessary evil" within our landscape for the next 25-30 years, the prospects for RE sources, over and above bagasse and hydro, in electricity production are promising.

The *potential for generating electricity from a portfolio of Renewable Energy sources*, over and above bagasse and hydro (using current technologies), *stands at 30% by 2015* – i.e. a **total of 56.6% inclusive of bagasse and hydro by 2015**. This 30% share corresponds to the share of oil in electricity production in the business-as-usual scenario. Since technological and regulatory challenges will have to be overcome in the short-to-medium term, it may be more realistic to aim for a minimum 10-15% of electricity production from RE sources of intermittent character, such as photovoltaic and wind energy, by 2012-2015. An action plan to pave the phased introduction of these RE technologies will have to be outlined by carrying out detailed assessment of these RE sources in the Republic of Mauritius. In addition, the successful deployment of high-fibre sugar cane can also increase the share of electricity production from biomass in the same timeframe. The full potential of 56.6% should be aimed for as soon as regulatory and technological barriers are removed.

It is also proposed that subsequent electricity demand beyond 2015 is met preliminary from RE sources, and that the nation envisages a post-coal era beyond 2033 through the research and development of alternative technologies such as biomass gasification. All efforts should be made to bring such technologies online sooner than later.

Another recommendation was to set up a Renewable Energy Network (REN) in Mauritius to foster Public, Private, Civil Society and aid agency (like UNDP – SGP/GEF) partnerships for the promotion of RE technologies in a concerted and meaningful way. The overarching aim is to enhance the Quality of Life of citizens of the nation through the sustainable and equitable use of RE resources. The REN will also provide the platform for multi-stakeholder dialogue in an ongoing way, the outcome of which should be used in policy decision making in the energy sector. One project that has been proposed through REN is to make the Island of Agalega completely "green" regarding its energy demand.

Although the transport sector has about 50% share of final energy consumption, it was agreed that it should be addressed separately, but nonetheless, decisively.

CURRENT STATUS OF PRIMARY ENERGY REQUIREMENT

First, we take stock of the *Primary Energy Requirement* (PER) of Mauritius. Today, energy is seen as a 'metatechnology' that drives all forms of development. The primary energy requirement of Mauritius has increased steadily over the past decade, and is expected to continue its rise in the future, especially as the country seeks to increase its economic output. However, this rise in PER has been supported mostly by a corresponding increase in imported fossil fuels, while energy production from local sources has remained more or less constant (please see Figure 1) – i.e. increase in thegap between energy requirement and local energy production. In 2005, imported fuels and locally available sources accounted for 79.7% and 20.3% of total PER, respectively.

The entire indigenous production is from renewable sources [93.3% bagasse, 3.8%hydro and 2.9% fuelwood]. It is clear from Figure 1 that the development of RE sources in Mauritius has remained **stagnant** over the past decade, as far as PER is concerned.

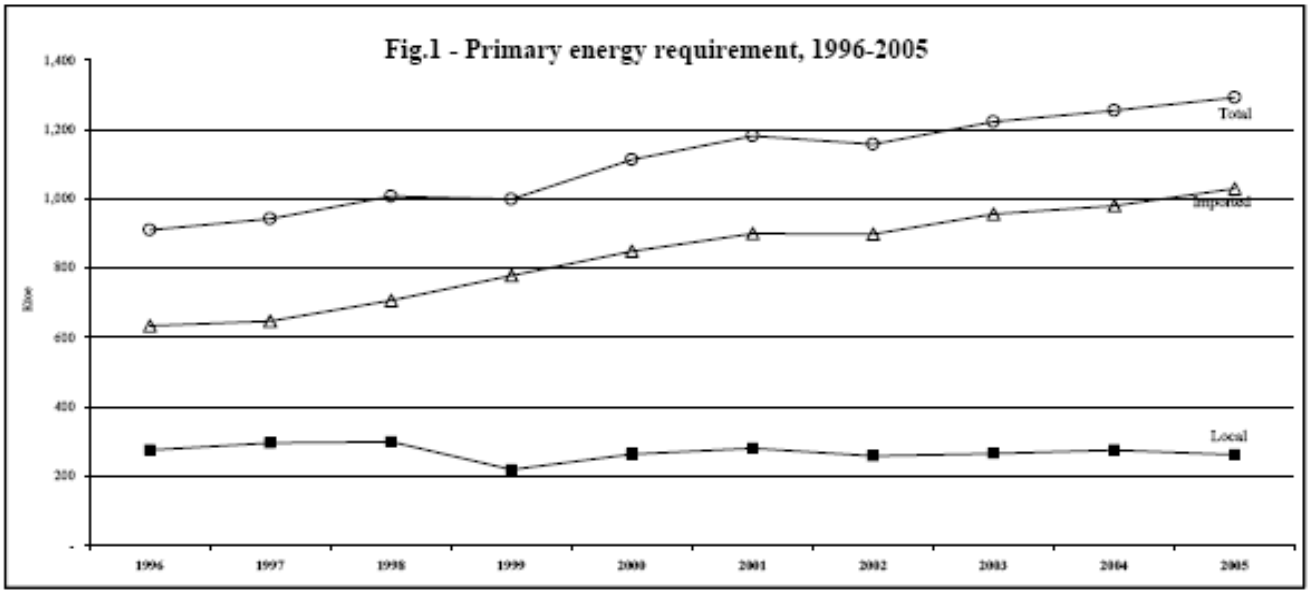

Figure 1. Primary energy requirement of Mauritius, 1996-2005 (Source: Energy and Water Statistics – 2005, CSO).

Our dependence on imported fossil fuels (see Figure 2) has increased steadily of the past decade. This import dependency places severe constraints on the current and future economic development of the country, especially at a time of rising fuel costs. Table 1 summarises the breakdown of cost by fossil fuel type for 2004 and 2005. The cost of petroleum products increased by 40.6% to 52.3%, while the cost of coal increased by 29.1% from 2004. These changes significantly increased the national expenditure on imported fuels from ~Rs 9.7 billion in 2004 to ~14.9 billion in 2005 – a 54% increase for only 3% increase in primary energy requirement. Cost inflations can be expected to continue in the years to come. As mentioned by the Ministry of Environment & NDU, fossil fuels also have detrimental effects on the environment and population health.

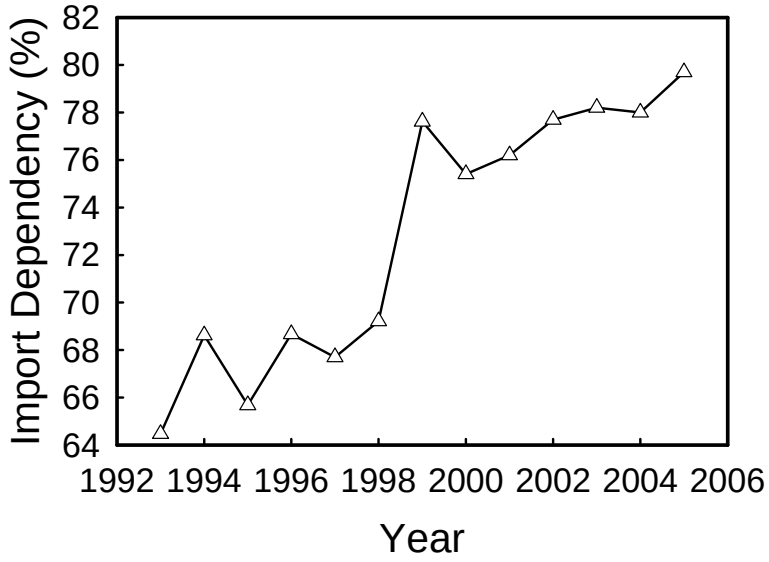

Figure 2. Dependency on imported fuels, 1993-2005

Table 1. Demand and cost comparisons of various fossil fuels: 2004 & 2005.

Energy Source	2004 Cost (c.i.f.) (Rs/tonne)	2005 Cost (c.i.f.) (Rs/tonne)	Increase in cost of fuel (%)	Change in importation (%)
Gasolene	11,751	16,737	42.4	-1.0
Diesel oil	9,701	14,651	51.0	3.2
Dual purpose kerosene	10,797	16,445	52.3	-3.4
Fuel oil	5,615	8,316	48.1	14.2
LPG	11,885	16,795	40.6	16.5
Coal	1,566	2,021	29.1	14.3

Data extracted from Energy and Water Statistics – 2005, CSO

RECENT TRENDS

POWER SECTOR

In order to decrease our dependency on oil, the power sector has gradually shifted towards the displacement of fuel oil by coal.[1] Independent Power Producers (IPP) generated 46.8% of electricity from either coal or co-generation in 2005. The existing capacity of IPPs is: 111 MW co-generation based power stations, 39 MW bagasse-based power plants, and 30 MW coal-based power plant. There is already commitment to increase co-generation capacity by 74 MW.[2]

Bagasse is the most widely used renewable energy source for the production of electricity. It yielded 130 GWh in 1997, and produced 301 GWh in 2005 (19.9% of electricity production).[3] Bagasse is expected to generate up to 600 GWh (by 2009 with plant at FUEL coming into effect) with efficient use of new technologies, including use of higher fibre cane.[4] According to CEB, electricity production from bagasse will reach 420 GWh (465 GWh according to MSIRI) when CTSav is commissioned in 2007. MSIRI figures indicate that electricity production from bagasse could reach 700 GWh by 2012 with plant at Medine coming online. The projected increase in the production of electricity from bagasse up to 2012 is summarized in Table 2.

[1] In 1970, dependency on oil was 70%, whereas it was 53% in 2005 with coal occupying 26%.
[2] Source: Central Electricity Board.
[3] Sources: Ministry of Public Utilities and CSO (Energy & Water Statistics – 2005).
[4] Source: MSIRI

Table 2. Electricity production from bagasse (GWh): 1997-2012.

Year	1997	2005	2007	2009	2012
Electricity generation from bagasse (GWh)	130	301	420-465	600	700

The significant increase in the generation of electricity from bagasse by 2012 – factor 5.4 - should serve as an example of innovative optimization of an existing RE source (biomass in this case) that should be replicated for other RE sources, such as wind, photovoltaic and biogas.

In 2005, 2015 GWh of electricity was generated (peak demand = 353 MW; night load = 150 MW). Extrapolation from past trend reveals that 3000 GWh will be generated in 2015, and demand is expected to reach 4500 GWh by 2025 (peak demand = 700 MW; night load = 300 MW).[5]

Assuming that co-generation was to be carried out with 65% contribution from coal (i.e. 860 GWh in 2007/08; 1120 GWh in 2009; 1300 GWh in 2012), MSIRI predicts that two-thirds (i.e. 2000 GWh out of 3000 GWh generated) of electricity production could be met by co-generation alone by 2015. This implies a 43.3% share for coal and a 23.3% share for bagasse in the net generation of electricity.

The above trends and projections are summarized in Figure 3. It is pointed out that ~100 GWh (see below) is produced annually from hydro, and this should be added to the plot shown in triangles – i.e. co-generation. The scope for renewable energy sources is shown by the regime marked in red. The deployment of practical RE sources is proposed for implementation in two phases, as is described in further details below.

Hefty investments (~Rs 7.5 billion) have been committed by Societe Usiniere du Sud (SUDS) will include co-generation capacity at 90MW (investment of ~Rs 4.8 billion). A 20-year contract has already been signed with CEB to produce grid-fed electricity.[6] This forms part of the clustering approach based around a rejuvenated sugar cane industry that is being promoted as part of the Adaptation Strategy Action Plan.[7] It is against this backdrop that coal is seen as "a necessary evil" for the 20-25 years to come.

[5] Sources: Ministry of Public Utilities & MSIRI.
[6] Source: Societe Usiniere du Sud
[7] Source: Mauritius Sugar Authority & Societe Usiniere du Sud.

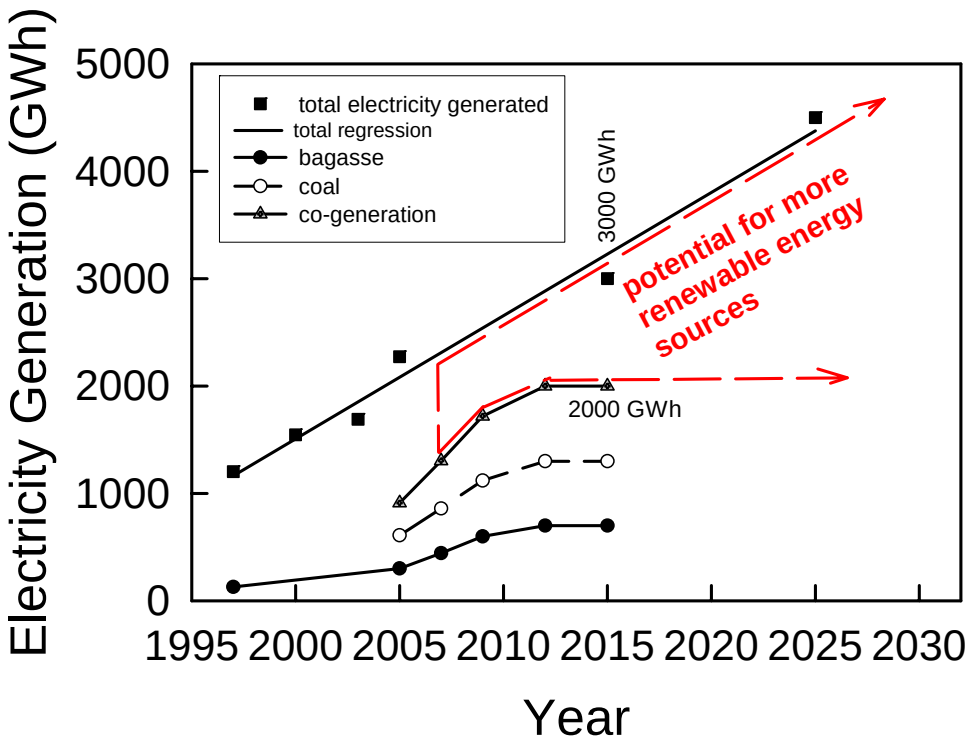

Figure 3. Scenario of the potential for RE energy in Mauritius.

TRANSPORTATION

This sector occupied 49.5% of final energy consumption in 2005, placing it at the forefront of the RE debate. Gasoline and diesel oil had 23.9% and 40.2% share, respectively, in transportation. On average, the energy consumption by the transport sector has been growing at about 3.4% per annum over the past 5 years.

Alcodis Ltd is currently producing ethanol (30M litres) in Mauritius using all available molasses and has initiated the E10 gasoline blend (10% ethanol-90% gasoline) on a trial basis in partnership with Total.[8] A 30M litres production capacity corresponds to sufficient ethanol to provide Mauritius with all its E25 (25% ethanol-75% gasoline).

As part of the sugar cane cluster, SUDS envisages the production of both refined white sugar and ethanol at Savannah. The productions lines will be situated adjacent to the co-generation power plant (CTSAV). The production of ethanol is expected to be between 12.5M-30M litres annually depending on the purity of molasses sent from the factory to the distillery.[9]

The production of ethanol by SUDS in its flexi-factory poses a problem to Alcodis Ltd, since the latter is currently consuming all molasses produced by the sugar industry. This situation raises pertinent questions: (1) Is the local market too small for more than one player?, and (2) Should raw materials be imported from overseas? This situation is particularly important since 80% of the cost of producing ethanol is in the cost of molasses.[10]
There are other initiatives by SMEs to produce biodiesel from waste oil (mineral and organic), but it would appear here again that there is not sufficient waste oil for several players in this field.[11] The Mauritius Research Council is currently undertaking several technical and economic

[8] Source: Alcodis Ltd
[9] Source: Mauritius Sugar Authority (15M litres each for Savannah and FUEL); 30M litres assumes production of ethanol from cane juice. Production of ethanol from molasses will yield only 12.5M litres.
[10] Source: Alcodis LTd
[11] Source: Ecofuel Ltd and Mauritius Glass Gallery

feasibility studies on waste vegetable oil, coconut oil and jatropha biofuels (for displacement of diesel oil), which complement the trial with E10 (for displacement of gasoline).

There is also the potential for biogas, which can be produced from organic waste, in the transport sector.[12] However, cultural barriers to the deployment of biogas will have to be addressed. Further, a quantitative analysis of the volume of biogas that can be produced in Mauritius under realistic scenarios of cultural, environmental, scalability, land availability and time constraints, among other factors, has to be conducted in order to facilitate public policy decision-making.

The unique dimensions of the transport sector means that it should be treated separately from the power sector. A **separate energy policy** should be targeted at this dominant sector, since it is one where significant displacement of fossil fuel can be envisaged.

WASTE-TO-ENERGY

Waste has become an economic commodity, and apart from having an Environment Industry based on waste recycling, waste can also be used as a raw material to generate energy. Two examples include the generation of heat and electricity by incinerating waste, and the production of biogas from organic waste.

The potential for generating energy from waste in Mauritius is real, but this will require much coordination with broader Solid Waste Management policies. This is especially so for incineration, since recycling of higher energy embodied wastes like plastics and packaging materials can make the process unattractive.[13] Incineration of Municipal waste, even after putrescible wastes are removed and assuming that higher energy embodied wastes are retained, raises the important question of location of incinerator given that there are insufficient buffer zones on our small island.[14]

Biogas (mostly methane gas) generated at Mare Chicose landfill is currently being flared. Site data shows that more than 1200 m^3 of biogas is flared per hour since 2004. Methane production is predicted to peak around 2013 and 85% of biogas would have been produced from the landfill by 2030, when the production of methane is expected to fall below 500 m^3/hr. The potential peak electrical energy is expected to be about 6 MWh in 2010-2015, making the use of modular 1-2MW spark ignition engines in series a viable potential. [15] Further delays in tapping this wasted biogas will only make this alternative less economically attractive.

[12] Source: Prof. Chan
[13] Source: Dr Mohee, University of Mauritius.
[14] Source: University of Mauritius & Ministry of Environment & NDU.
[15] Source: University of Mauritius.

The potential for making biogas from sludge and animal waste was also discussed. Biogas produced from sludge obtained from wastewater treatment is already a reality at the St Martin treatment plant. Preliminary studies show that approximately 2.6 MWh of electricity could be obtained from biogas obtained from the wastewater treatment process.[16] Although this amount of electricity is quite insignificant compared to the national electricity requirement, it can nevertheless be used effectively as a Distributed Energy System to produce part of the energy requirement of the water treatment plant itself (as is the case). The production of biogas from animal waste is widely practised in several countries of the world, and hence it has several merits. For example, it can be used to generate electricity or be used as a fuel for lighting, cooking and running automotive vehicles.[17] Biogas has the potential for a large impact on the primary energy requirement of the transportation sector. Integrated farming is currently being implemented in Mauritius, and all its benefits will need to be harnessed to address energy issues at the local level and as part of distributed energy systems. The magnitude of biogas production from animal waste will have to be quantified for more in-depth analysis.

OTHER RENEWABLE ENERGY SOURCES

The potential for hydro has already been maximised with average annual generation at 100 GWh (60 MW installed capacity).[18] However, CEB is conducting a feasibility study for the potential for micro-hydro electricity generation.

There have been several trials with wind and photovoltaics in the Republic of Mauritius but with mixed results. For instance, pilot projects on wind energy generation at Grand Bassin and Rodrigues were discontinued in the early to mid-1990s because of poor maintenance and use of systems that were not designed to withstand our cyclonic weather conditions.[19] More recent trials of stand-alone street lighting systems and PV-hybrid electricity generation on Agalega suffered similar fate because of either the lack of planning and expertise to maintain PV systems or the use of out-of-date equipment.[20] The relative success of several street lighting projects using PV on the island of Mauritius is also largely unaccounted for. There was a call from participants to document these past failures/successes systematically so that future development could leapfrog on past experiences.

Wind energy stands at 0.44 GWh all of which is generated in Rodrigues. Three 60 kW wind turbines with tilting ability were installed in Rodrigues in 2003. Although no wind parks currently exist in Mauritius, a 25 MW wind farm (comprising twenty 1.25 MW turbines) is being contemplated for installation at Bigara.[21]

ENERGY EFFICIENCY

The promotion of RE sources should be accompanied hand-in-hand with energy efficiency measures at all levels, including the manufacturing and service sector, at all levels of the economy and in the use of energy for transportation. In particular, overdue attention should be given to the construction/building industry. The design and construction of low-energy embodied buildings based on ecological principles (e.g. solar passive designs) suitable for our sub-tropical climate should be promoted. Such buildings also have relatively lower energy running costs over their lifetimes. For instance, the setting up of building standards and an energy-rating scheme for buildings (including houses) should be envisaged and accompanied, where possible, by appropriate incentives. Energy rating codes should also be envisaged for electrical appliances.

[16] Source: University of Mauritius.
[17] Source: Prof Chan.
[18] Source: CEB
[19] Source: CEB
[20] Source: Outer Island Development Corporation.
[21] Source: CEB

Further, the **process of educating** citizens on energy efficiency and sustainable use of energy should be given more careful attention so that successful attitudinal changes can be effected for long-term sustainability. This necessitates the involvement of civil society and broad-base participation of communities, who understand their local situations better than implementing authorities.[22] The process of education will also have to tackle the issue of capacity building for the promotion of sustainable energy technologies. This process should form part of lifelong learning for a more sustainable society.

Fiscal and economic incentives will have to be put in place for the promotion of RE sources, and these schemes may well be coupled with energy efficiency measures. For instance, by making certain energy efficiency measures pre-requisites for qualification for economic/fiscal incentives, or by implementing these incentives in proportion to energy saving initiatives at the household and organisational levels.

It would be useful to undertake a comprehensive energy audit of various sectors of the economy so that targeted energy efficiency measures can be developed according to their specific needs, constraints and resources.

INTERNATIONAL COMMITMENTS

Mauritius signed the UN Framework Convention on Climate Change (UNFCCC) during the UNCED conference at Rio in September 1992, and incidentally, was the first country to ratify it. Further, Mauritius is also party to the Mauritius Strategy for the further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. At section 2, "SIDS acknowledge that sustainable development is primarily a national responsibility", which calls for, among others, the promotion of "increased energy efficiency and development and use of renewable energy as a matter of priority".

WHICH WAY FORWARD FOR RE IN ELECTRICITY PRODUCTION?

Mauritius, like most Small Island Developing States, is bestowed with bountiful renewable energy supplies from the sun (solar thermal and photovoltaics), wind and the ocean.[23] Incidentally, wind and photovoltaics (PV) have seen 28.6% and 26.2% annual growth rates between 1995 and 2005, and grid-connected PV has been the fastest growing energy technology in the world.

There are specific areas of Mauritius (and other Islands) that have good regime either for wind or solar insolation.[24] For instance, the Northern and South Western parts of Mauritius obtain a solar radiation of 6 kWh/m^2/day, making them very attractive regions for PV systems. Further, the North East and South East parts of Mauritius have very good wind regimes for wind farming. Interestingly, with an annual mean wind speed of 12.8 km/h (3.6 m/s) across Mauritius[23], the potential for deploying small-scale wind generators (< 1 kW) capable of meeting the requirements of the average household offer an additional area to be considered. However, realisation of the full potential for wind and solar energy sources rely on accurate wind and insolation maps that take into account long-term climate variations. The MRC will collaborate with the Mauritius Meteorological Services to develop digital wind and insolation maps for Mauritius (and other Islands?).

The widespread uptake of these proven RE technologies have come despite their relatively higher costs per kWh of these RE sources. The principle factor behind the success of the strong growth of the wind and PV industries worldwide has been proactive Renewable Energy Policies supported by Governments.[25] The main components of forward-looking RE Policies are:

[22] Sources: CEDREFI and UNDP – SGP/GEF
[23] Source: Mauritius Meteorological Services
[24] Source: Mauritius Meteorological Services and MPU
[25] Source: Mauritius Research Council.

- Feed-in policies (price of RE fed into the grid and net metering)
- National renewable portfolio standards (i.e. RE targets)
- Fiscal and economic incentives (e.g. rebates, subsidies, Carbon trading/tradable RE certificates, RE financing schemes, green power purchasing, Carbon tax etc….)

The exact shape of the above policies will have to be developed through an action plan. There are several examples of proactive RE policies that have been developed and implemented around the world, in both developed and developing countries. A fruitful exercise will be to build an inventory of these RE policies and RE laws that have been proposed or enacted overseas, and to use these to carve specific policies for Mauritius.

Distributed Energy Systems

Global Energy Scenarios show that Distributed Energy Systems (DES) will become institutionalised in the near-future. There are many advantages for generating electricity at the point of consumption (i.e. at the household or community level) including, scalability, flexibility, load sharing, ability to work independently, increased control at the local level (community participation and empowerment), and even distribution of political, technological, economic and social resources. Good design of DES can substantially minimise its possible drawbacks. Incidentally, RE sources such as wind, PV and biogas lend themselves very well as DES. It comes as no surprise then that grid-connected PV is the largest growing RE industry in the world.[26]

Biomass Gasification

It is imperative to think beyond coal. In addition to enhancing the deployment of RE sources like PV, wind and biogas (and also wave/tidal/hydrokinetic in the longer run), the prospects of biomass gasification technologies in the long-term have to be seriously investigated. Steps are currently being taken to set up a demonstration Biomass Integrated Gasification Combined Cycle (BIG-CC) plant in Mauritius. The gasification of biomass, especially bagasse, should be seen as a promising candidate for the displacement of coal in electricity generation in the long run. Although BIG-CC offers the potential to generate 3390 GWh of electricity using high-fibre cane,[27] much research and development is required in this field.

RECOMMENDATIONS

The following **recommendations** are related only to the power sector. As mentioned above, primary energy requirement in the transportation sector, although it is significant and heavily dependent on imported petroleum products, will need to be addressed elsewhere because of its specificities.

Assuming that 66.6% (i.e. 2000 GWh) of our electricity generation will be done through co-generation (35% bagasse / 65% coal) by 2012-2015, and that hydroelectricity capacity remained unchanged at 100 GWh annually (i.e. 3.3%), a mix of RE sources could potentially be used to generate the remaining 30% of electricity, which under a business-as-usual case would be produced from oil. However, it should be noted that the 30% share of renewable could in principle also accommodate an increase in electricity production from bagasse with the introduction of high-fibre cane. **The effective share of RE in electricity production could potentially be 56.6% by 2015 (representing an equivalent saving of Rs 1.63 billion on fuel oil importation at 2005 average price)**.

The production of 30% of electricity from RE sources will need careful management bearing in mind that RE technology is continuously being improved. For instance, the most widely deployed RE systems like PV and wind are known to create grid instabilities above ~20% when

[26] Source: MRC.
[27] Source: MSIRI.

load becomes difficult to manage. Several solutions could be contemplated: (1) investigate alternative energy storage systems (e.g. pumping water using wind energy during off-peak for hydroelectricity generation during peak time); (2) deploying RE systems as stand-alone-systems (this will require energy storage using batteries – weakest link in the RE system), and/or (3) set a lower but more practical target that will allow technological and regulatory barriers to be overcome before deploying RE sources to its full potential.

Successful deployment of RE sources in electricity production requires the setting of mandatory targets, together with sound economic/fiscal incentives backed by proper legislation. Several countries, big and small, have successfully implemented RE standards together with economic and fiscal incentives for the promotion of RE. Existing success stories can be used for modelling our specific needs. For instance, economic/fiscal incentives should be coupled to mandatory energy efficiency measures for qualification. All efforts should be spent to institutionalise 'energy efficiency' in the short-term. These will require community participation, and investment in educational awareness and literacy programs for sustainable energy uses. Energy efficiency measures such as (1) energy standards in the building industry and an energy rating scheme for houses/buildings; (2) energy rating of electrical goods; and (3) mandatory use of solar thermal heaters, should be envisaged among others.

One way forward for RE in Mauritius would be to set a realistic target of 10-15% electricity generation from alternative RE sources of intermittent character, over and above bagasse and hydro - assuming current state-of-the-art, by the year 2012, and potentially 56.6% by 2015 should all technological and regulatory barriers be addressed adequately. Introduction of higher fibre cane will only increase the relative contribution of bagasse in electricity production. The production of electricity from biogas could help to overcome the drawbacks of wind and PV, but further studies are required to quantify the prospects of the generation of electricity from biogas. Here again, the realistic minimum target of 10-15% provides the flexibility to address outstanding issues related to electricity generation from biogas. This minimum target provides a pathway to displace oil in the production of electricity, and allows for the effects of energy efficiency on electricity production to be fully articulated. Importantly, this will enable RE sources to be introduced in an incremental manner - i.e. a pace that allows the beneficial socio-economic effects to be properly gauged.

As far as renewable energy is concerned, it will be financially prohibitive for a small economy like Mauritius to support too many experimental projects, especially given the high initial capital investment costs. It is, therefore, proposed that immediate efforts should be concentrated on wind, solar and biogas. This is in addition to research already being carried out to increase the biomass of sugar cane.

It is also suggested that increases in electricity requirement beyond 2015 should be met from RE sources in a pragmatic way. Our dependence on coal in the long run (after 2033) should also be decreased by substitution with RE sources. Bagasse gasification will have to play a key role in the generation of electricity in the long run.

A Renewable Energy Network (REN) regrouping all stakeholders in the energy sectors has been suggested. REN will be to provide a forum for continuous dialogue between stakeholders for the promotion of RE in Mauritius. A project for making Agalega a 'green' island (as far as its energy needs are concerned) has been proposed for implementation through REN.

Annex A

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