Climate Investment Funds

SREP/SC.11/6
May 30, 2014

Meeting of the SREP Sub-Committee
Montego Bay, Jamaica
Friday, June 27, 2014

Agenda Item 6

SREP Expert Group Report on Selecting New Pilot Countries

PROPOSED DECISION

The Sub-Committee welcomes the *Report of the Expert Group to the SREP Sub-Committee on Selection of New Pilot Countries,* (document SREP/SC.11/6). Based on the recommendations proposed by the SREP Expert Group, the Sub-Committee approves the following countries to be selected as new SREP pilot countries (listed in alphabetical order):

a) …
b) …
c) …
….

The Sub-Committee further agrees that up to [USD 300,000] may be provided to each of the new pilot countries selected to enable them to take a leadership role in working with the MDBs to develop their full investment plans.

CLIMATE INVESTMENT FUNDS

Program for Scaling Up Renewable Energy in Low Income Countries [SREP]

Selection of New Pilot Countries

Report of the Expert Group to SREP Sub Committee

21st May 2014

Contents

ACKNOWLEDGEMENTS

The SREP Expert Group wishes to acknowledge the support of the CIF Administrative Unit and the inputs from the African Development Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, the IFC, the Inter-American Development Bank and the World Bank. The background and insights provided by all the aforementioned enhanced and contributed much to our discussions as an Expert Group.

The Expert Group also wishes to thank the CIF team for their work in preparing for our meetings in Washington DC, collating of the 40 EOIs that were received and their assistance during our deliberations. Special thanks to Zhihong Zhang of the CIF Administrative Unit for his assistance and guidance throughout our work.

1.0 INTRODUCTION

This report covers the second series of considerations made by the SREP Expert Group, all of whom were part of the team that undertook reviews for the pilots in 2010. Unfortunately, due to ill health, Anders Rasmussen was unable to join the team this time.

The evolution of the SREP Programme since its inception has helped clarify the role that it can play in various markets and the learnings from the first deliberations of the Expert Group together with the knowledge collected over the last four years has been of considerable value in the current review.

The SREP Sub Committee requested that the Expert Group review the 40 Expressions of Interest (EOI) received from eligible countries, as defined and approved by the SREP Sub Committee. At the time of selection for the first pilot programmes countries were asked only to confirm their interest in being considered for SREP funding; in this second round countries were asked to prepare a relatively detailed EOI and this information provided a very useful base from which reviews of each country were undertaken.

The CIF Administrative Unit, in collaboration with the Multilateral Development Banks (MDBs), informed eligible countries of the SREP call for applications and invited interested governments to submit a structured expression of interest to be considered as recipients of SREP funding. All the EOI received by the CIF Administrative Unit were made available to the Expert Group for its consideration prior to their travel to Washington.

The SREP programme sees close coordination with the MDBs, through whom the SREP is implemented. Arrangements were made for the Expert Group to interact with the representatives of the MDBs to discuss, on a regional basis, the MDB experience with the SREP programme to date. These discussions provided an opportunity for the MDBs to share their thoughts on SREP, outcomes from their experience with the first pilot countries, key challenges in the renewable/energy markets in their region and where SREP could add most value.

2.0 EXPRESSIONS OF INTEREST

As noted, in contrast to the initial call for pilot countries for SREP, more comprehensive Expressions of Interests (EOI) were requested from country applicants. A total of 40 EOI were received and they provided the background for review by the EG.

While the detail of the EOI varied, this was often a reflection of the differences between the energy situation in each country, their progress towards universal energy access and the standard of enabling environments. The EG found that in general the EOI were frank and open about their country energy status, challenges faced and actual progress to date; this was a helpful starting point for the EG review of each country.

The Letter of Invitation to countries suggested that their EOI cover the points outlined below.

I. Country and Government Agency Submitting Expression of Interest

II. Description of the Country and Energy Sector Context

Please provide a summary of the country and energy sector context, including resource potential for deploying renewable energy, status of energy access (population with access to electricity), renewable energy policies, targets, and implementation measures.

III. Rationale for Selected Sectors for SREP Financing

Please identify barriers for the deployment of renewable energy, potential sector, sub-sectors, and technologies for possible SREP financing as well as the rationale for prioritizing them for SREP interventions.

IV. Enabling Policy and Regulatory Environment

Please provide an overview of the existing policies, legal framework, market and regulatory structure for renewable energy development and the potential impacts of public and private sector interventions in addressing the barriers. Discuss the existing regulatory environment for attracting private investments in renewable energy technologies and governance within the energy sector, including commercial performance of relevant institutions, pricing and tariff practices, competitive procurement of goods and services, the transparency and accountability of these practices and the degree to which they are subject to public oversight.

V. Institutional and Technical Capacity

Please provide an analysis of the institutional and technical capacity for implementation, including the government's ability to effectively absorb additional funds. Please also provide a preliminary assessment of potential implementation risks.

VI. Programs of MDBs and Development Partners

Please describe briefly the ongoing and planned programs of the relevant multilateral development banks (MDBs) and other development partners relevant to energy access and renewable energy and how the proposed interventions for SREP would link to and build upon these programs.

3.0 METHODOLOGY

3.1 Criteria

In performing its task, the EG was guided by the SREP design document and an updated "Criteria for Selecting Country and Regional Pilots under the Program for Scaling Up Renewable Energy in Low Income Countries" (February 2014) which outlined the criteria to be used to select the country or regional pilots. The criteria states:

> *In selecting the initial SREP pilots in 2010, the Sub-Committee considered two perspectives: (i) a country's willingness to meet the criteria and to achieve the objectives of the SREP, and (ii) a country's potential and capacity to implement a SREP program. In addition, regional balance and natural conditions for developing renewable energy were included as part of the criteria.*
>
> *It is proposed that the previously agreed criteria be used as a basis for considering new SREP pilot countries, with some modifications reflected in the criteria below. Furthermore, it is proposed that information submitted by the eligible countries in their expressions of interest be taken into account in ranking the countries against the criteria and that weights be assigned to the proposed criteria to be applied by the expert group in its review and scoring of the expressions of interest.*
>
> *Below are five criteria (two quantitative and three qualitative) with weightings proposed for selecting new SREP pilot countries:*
>
> a) *Lack of energy access (weight: 30%). This will be measured in terms of percentage of total population with access with electricity. Countries with the lowest access to electricity should be favoured. Data from public sources will be compiled.*
>
> b) *Relative poverty (weight: 10%). This will be measured using gross national income (GNI) per capita. Data from public sources will be compiled.*
>
> c) *Enabling environment (weight: 30%). This will involve three aspects as elaborated below:*
>
> > *i. The existence of, or a willingness to, adopt, within an appropriate timeframe, supportive regulatory structures and institutions to support renewable energy development (including agencies to promote/utilize renewable energy, if relevant). This could include policies and regulations promoting renewable energy, such as feed-in tariffs, tax incentives, subsidies, concessional financing or renewable portfolio standards.*
> >
> > *ii. An enabling regulatory environment that promotes private sector investments in renewable energies. This could include policies that support private sector participation and public-private partnerships. This*

could also include availability, or willingness to develop, local capacity along the renewable energy supply chain, including manufacturing, training, and operations and maintenance.

iii. Sector-wide energy development strategies that are open to integrating renewable energy into energy access and supply enhancement programs or targets for large-scale renewable energy deployment. Countries could be assessed on national and local strategies and targets for electrification, and current or projected share of renewables in the energy portfolio.

d) *Good governance within the sector (weight: 10%). An assessment of sector governance could include commercial performance of relevant institutions, pricing and tariff practices, and competitive procurement of goods and services, the transparency and accountability of these practices and the degree to which they are subject to public oversight.*

e) *Potential capacity for implementation, including sufficient institutional and technical capacity (weight: 20%). This could include a track record of renewable energy projects completed or initiated with participation of private sector, previous experience implementing and using renewable energy technologies, capacity for operating and maintaining renewable energy systems. In specific cases, the existence of a track record may not be a strict criterion and a willingness to advance in the area of renewable energy could be sufficient. The government's ability to effectively absorb additional funds should also be considered.*

Regarding regional balance for the selection of new SREP pilot countries, it is recognized that the emphasis is to be placed on the opportunities to increase energy access noting the particularly low level of energy access in Africa. It is further recognized that from the perspective of sharing knowledge and lessons SREP can benefit from including a diverse group of countries and regions.

The Sub-Committee suggests that the expert group, taking these considerations into account as well as the submitted expressions of interest, recommend a significant number of countries from Africa (it is proposed at least 8 out of 12) and that the remaining recommended countries should include representation from the other regions (South and East Asia and Pacific, Europe and Central Asia, and Latin America and Caribbean).

The Sub-Committee will reach a decision on the identification of new countries that could benefit from the SREP program only after due consideration of the expressions of interest submitted by eligible countries as well as the scoring and recommendations to be provided by the expert group.

3.2 Score Card

The Criteria above reflect the Summary of the Co-Chairs from their meeting in October 2013 in which they outlined that the EG should be re-convened. They requested that the EG identify up to 12 new countries that could benefit from the SREP programme while contributing to the overall programmatic objectives of SREP; that in selecting countries (i) focus should be given to energy access, noting the particularly low level of access in Africa, and (ii) allocation of indicative resources should be based on country characteristics.

Recognising these requests and that the EG provide an underlying ranking for each country, initial discussions in Washington focused on the most appropriate structure and allocation procedure for this analysis.

While the EG acknowledges the benefits of a more formal scoring process, the very nature of the available data, its validity and applicability to the task in hand were all aspects of concern.

The CIF administration provided the two base parameters for each country, percentage access to electricity and GNI for all countries.

3.2.1 Energy Access

The use of electricity access[1] as a proxy for wider energy access could be debated, but given the increased focus of this review on opportunities for SREP to support electrification (with renewables) this was seen as an appropriate criterion. To create the indicator for modern energy access for countries, the percentage of the population without access to electricity was used as the base value. It is important to note that this indicator is a proxy but a more easily recorded proxy than those dealing with efficient biomass cook stoves or LPG for that matter, that have less reliable data. The importance of this parameter is clearly seen within the analysis summarised below.

It should be noted, however, that this single indicator does not allow discrimination between access in urban and rural areas, whether this was grid or standalone, or women and men headed households, all of which could have provided insights into the social and equity underlying policy principles driving modern energy access. This, and guidance given by the Sub-Committee on other criteria, have tended to reduce the attention given to this differentiation of access and in particular to considerations around the importance of substitution of biomass for cooking for more efficient biomass; this was addressed in more detail in the selection of the first set of pilots under SREP .

3.2.2 GNI

The application of the GNI data was debated at some length but it was decided that a parameter that used a ratio of the difference between the highest GNI ($5650 – Tuvalu) and the country GNI against the highest GNI provided an appropriate relativity across the sample range. Given the low GNI for most of the countries under consideration, this parameter has limited impact across the country scores as most of the highest ranking have GNI figures a quantum below that of Tuvalu resulting in minimum differentiation amongst the leading candidates.

[1] This data was SE4ALL defined WB data from a common database and was not critically evaluated by the EG.

3.2.3 Enabling Environment, Sector Governance and Capacity for Implementation

The quantification, on a numerical basis of the relative quality of enabling environment, sector governance and capacity for implementation relies, by its very nature, on a combination of somewhat subjective evaluations.

To provide a standard approach across all countries a scorecard was established which used the considerations summarised in the requested criteria, as outlined above, and ranked each section on a low / medium / high scale, representing 30%, 60% and 100% of the available score for each section. The country scorecard was built as an Excel sheet that could then be fed directly into the master scorecard.

The sample shown below is an empty scorecard that contains details on each of the points considered in every section. With the low / medium / high ranking determined this was then included in the overall master sheet allowing a final "score" to be determined for each country.

4.0 INITIAL RESULTS

A summary of results are presented in the following Tables and Graph:

- TABLE 1 - a summary (alphabetical) of allocated points for each country.
- TABLE 2 - a summary ranking of all countries based on total scores
- GRAPH 1 – a representation of the results for all countries
- GRAPH 2 – the top 20 countries
- GRAPH 3 – ranking with African countries
- TABLE 3 – a summary of other Initiatives underway in recommended countries

SAMPLE TEMPLATE

COUNTRY:					
		ENTER Section Score	**Calculated Rank**	**Low, Medium, High**	**Notes**
	Enabling Environment (30%)				
i	· the existence of, or a willingness to, adopt, within an appropriate timeframe, e.g plan of bringing energy related policies				
	· supportive regulatory structures and institutions to support renewable energy development				
	· feed-in tariffs, net metering				
	· tax incentives, concessional financing, subsidies, custom duty exemption				
	· renewable portfolio standards.				
	Section score (maxm 10)	0			
	Ranking score		3	LOW	
ii	· an enabling regulatory environment that promotes private sector investments in renewable energies.				
	· policies that support private sector participation and public-private partnerships, existence of IPPs , Bank and financial institution				
	· availability, or willingness to develop, local capacity, training, resource allocation by the government				
	· the renewable energy supply chain, including local manufacturing, assembling facilities				
	· operations and maintenance and adaptive R & D and any programs n policies				
	Section score (maxm 10)	0			
	Ranking score		3	LOW	
iii	· sector-wide energy development strategies that are open to integrating renewable energy into energy access and supply enhancement programs or targets for large-scale renewable energy deployment. Yearly target set by country's budget and yearly plan				
	· national and local strategies and targets for electrification, and current or projected share of renewables in the energy portfolio and budget allocation by govt, target of installation and generation and electrification in official programs etc				
	Section score (maxm 10)	0			
	Ranking score		3	LOW	
	Section score (maxm 30)		**9**		
	Good governance (10%)				
	· commercial performance of relevant institutions,				
	· pricing and tariff practices				
	· competitive procurement of goods and services,				
	· the transparency and accountability of these practices and the degree to which they are subject to public oversight				
	Section score (maxm 10)	0			
	Ranking Score		**3**	LOW	
	Potential capacity for implementation, institutional (20%)				
	· track record of renewable energy projects completed or initiated with participation of private sector				
	· previous experience implementing and using renewable energy technologies				
	· capacity for operating and maintaining renewable energy systems.				
	· government ability to effectively absorb additional funds				
	Section score (maxm 20)	0			
	Ranking Score		**6**	LOW	

TABLE 1 – Overall Results

Country	Access to Electricity (% of Population)	GNI Per Capita (USD)	Access allocation =(100-Access)*.30	GNI Allocation = (5650-GNI)/5650*10	Enabling Environment	Governance within Sector	Capacity for Implementation	Total
	Data	Data	30%	10%	30%	10%	20%	Total
Afghanistan	41	680	18	9	12	3	6	**47**
Bangladesh	55	840	14	9	30	6	20	**78**
Benin	28	750	22	9	19	6	12	**67**
Bolivia	80	2220	6	6	15	6	12	**45**
Burkina Faso	13	670	26	9	9	3	6	**53**
Cambodia	31	880	21	8	18	6	6	**59**
Cameroon	49	1170	15	8	9	3	6	**41**
Central African Republic	9	510	27	9	9	3	6	**54**
Chad	4	770	29	9	9	3	6	**55**
Comoros	48	840	16	9	9	3	6	**42**
Congo, Democratic Republic of	15	230	26	10	12	3	6	**56**
Djibouti	50	1513	15	7	18	6	6	**52**
Eritrea	33	450	20	9	15	3	6	**53**
Gambia	31	510	21	9	12	3	6	**51**
Georgia	100	3270	0	4	15	3	6	**28**
Ghana	61	1550	12	7	30	10	20	**79**
Haiti	34	760	20	9	18	6	12	**64**
Kiribati	56	2520	13	6	19	6	20	**64**
Kyrgyz Republic	100	990	0	8	15	6	6	**35**
Lao PDR	66	1270	10	8	18	3	12	**51**
Lesotho	17	1380	25	8	18	3	6	**59**
Madagascar	14	430	26	9	18	3	12	**68**
Malawi	9	320	27	9	15	6	6	**64**
Marshall Islands	56	4040	13	3	18	3	6	**43**
Micronesia	56	3230	13	4	15	3	6	**41**
Myanmar	49	1144	15	8	12	3	6	**44**
Nicaragua	74	1650	8	7	26	6	20	**67**
Niger	9	390	27	9	12	3	6	**58**
Rwanda	11	600	27	9	19	3	12	**70**
Samoa	100	3260	0	4	12	6	6	**28**
Senegal	57	1030	13	8	18	3	12	**54**
Sierra Leone	12	580	26	9	9	6	12	**62**
Somalia	29	107	21	10	9	3	6	**49**
South Sudan	2	790	29	9	9	3	6	**56**
Tajikistan	100	860	0	8	15	3	12	**38**
Togo	28	500	22	9	9	3	6	**49**
Tonga	92	4220	2	3	15	6	12	**38**
Tuvalu	41	5650	18	0	18	10	12	**58**
Uganda	15	440	26	9	26	6	12	**79**
Zambia	19	1350	24	8	15	6	6	**59**

TABLE 2 – Ranking of Results

Country	Access to Electricity (% of Population)	GNI Per Capita (USD)	Access allocation =(100-Access)*.30	GNI Allocation = (5650-GNI)/5650*10	Enabling Environment	Governance within Sector	Capacity for Implementation	Total
	Data	**Data**	**30%**	**10%**	**30%**	**10%**	**20%**	**Total**
Ghana	61	1550	12	7	30	10	20	**79**
Uganda	15	440	26	9	26	6	12	**79**
Bangladesh	55	840	14	9	30	6	20	**78**
Rwanda	11	600	27	9	19	3	12	**70**
Madagascar	14	430	26	9	18	3	12	**68**
Benin	28	750	22	9	19	6	12	**67**
Nicaragua	74	1650	8	7	26	6	20	**67**
Haiti	34	760	20	9	18	6	12	**64**
Kiribati	56	2520	13	6	19	6	20	**64**
Malawi	9	320	27	9	15	6	6	**64**
Sierra Leone	12	580	26	9	9	6	12	**62**
Lesotho	17	1380	25	8	18	3	6	**59**
Cambodia	31	880	21	8	18	6	6	**59**
Zambia	19	1350	24	8	15	6	6	**59**
Tuvalu	41	5650	18	0	18	10	12	**58**
Niger	9	390	27	9	12	3	6	**58**
Congo, Democratic Republic of	15	230	26	10	12	3	6	**56**
South Sudan	2	790	29	9	9	3	6	**56**
Chad	4	770	29	9	9	3	6	**55**
Central African Republic	9	510	27	9	9	3	6	**54**
Senegal	57	1030	13	8	18	3	12	**54**
Eritrea	33	450	20	9	15	3	6	**53**
Burkina Faso	13	670	26	9	9	3	6	**53**
Djibouti	50	1513	15	7	18	6	6	**52**
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Gambia	31	510	21	9	12	3	6	**51**
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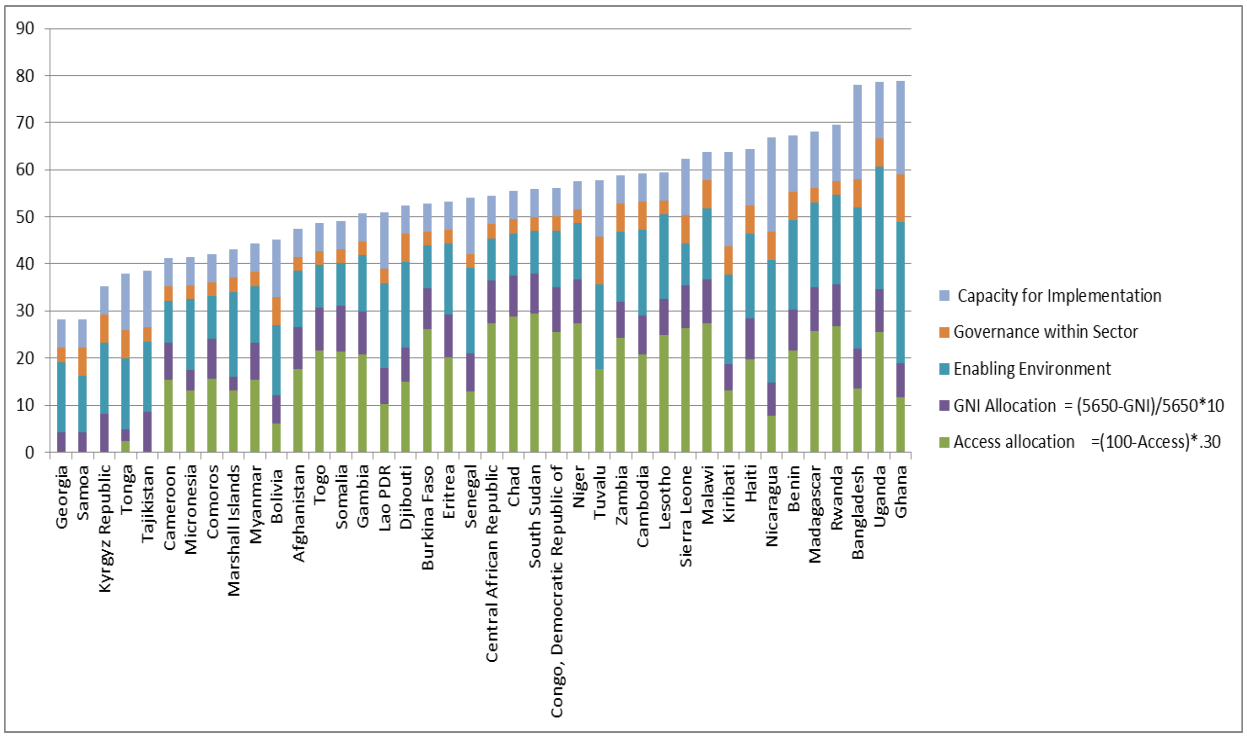
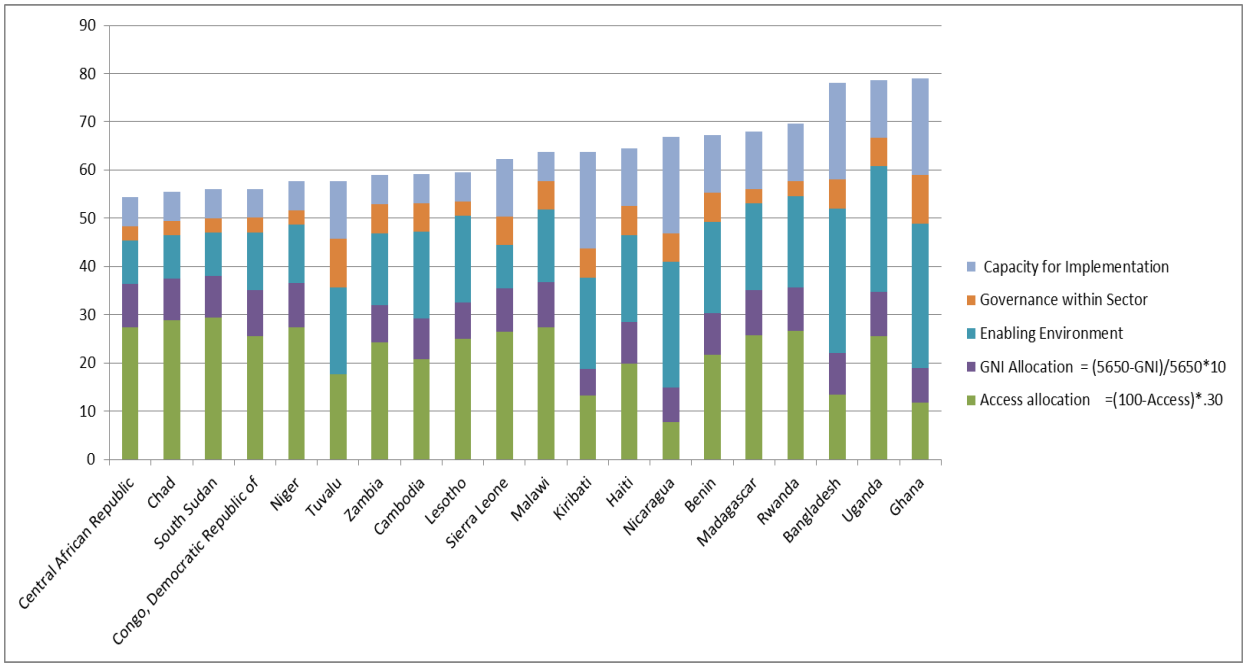
Togo	28	500	22	9	9	3	6	**49**
Afghanistan	41	680	18	9	12	3	6	**47**
Bolivia	80	2220	6	6	15	6	12	**45**
Myanmar	49	1144	15	8	12	3	6	**44**
Marshall Islands	56	4040	13	3	18	3	6	**43**
Comoros	48	840	16	9	9	3	6	**42**
Micronesia	56	3230	13	4	15	3	6	**41**
Cameroon	49	1170	15	8	9	3	6	**41**
Tajikistan	100	860	0	8	15	3	12	**38**
Tonga	92	4220	2	3	15	6	12	**38**
Kyrgyz Republic	100	990	0	8	15	6	6	**35**
Samoa	100	3260	0	4	12	6	6	**28**
Georgia	100	3270	0	4	15	3	6	**28**

GRAPH 1 – Overall Results



GRAPH 2 – Top 20 Ranked Countries



GRAPH 3 – African Countries Only

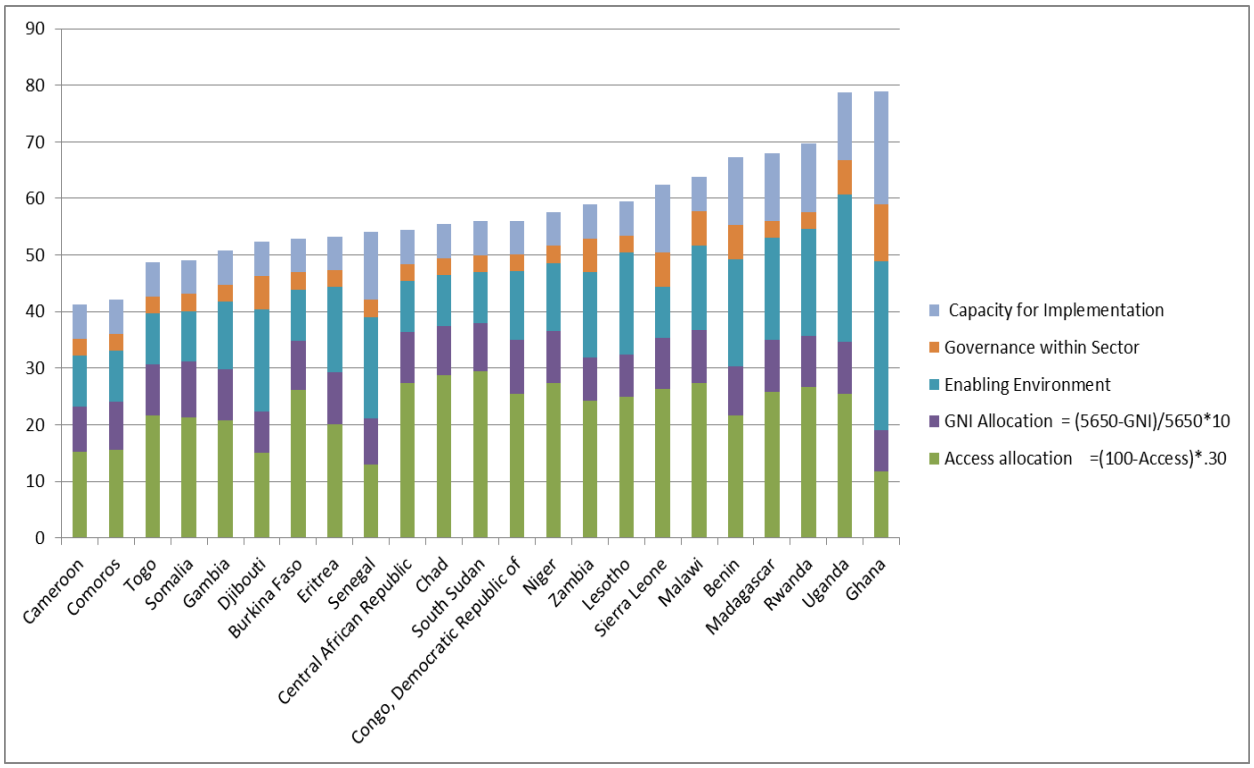


Table 3 – Summary of Other Initiatives in Recommended Countries

Selected Countries	FIP/PPCR	Power Africa	SE4All 2014 Priority Countries
Bangladesh	X		
Benin			
Ghana	X	X	X
Haiti	X		
Kiribati			
Lesotho			
Madagascar			
Malawi			
Nicaragua			
Niger			
Rwanda			X
Sierra Leone			X
Uganda			X
Zambia	X		

5.0 COMMENTS ON METHODOLOGY

5.1 The Scoring Process

As noted, while the electricity access and GNI figures provide a numerical base from rankings under these considerations, the other determinations involve somewhat more subjective evaluations. Despite this constraint, the EG believes that the rankings generated by the process do provide a reasonable relative comparison amongst all the countries considered.

Some key features of the results are as follows.

5.1.1 Energy Access

In general, countries that have been recommended fall into one of two categories with surprisingly few in between:

- those with low access to energy and a poor enabling environment
- those with a higher level of access and a better developed enabling environment

The results show that the level of energy access has a significant influence on the total country score under the methodology used for the current ranking. However there appears to be a reasonable balance between the influence of energy access and the level of the enabling environment so that the latter has an appropriate influence in discriminating between the two categories noted above. This is in keeping with the underlying premise of the SREP pilot selections in which the focus has been directed more at those countries that have a demonstrated success in promoting policies and regulations for renewables and the engagement of the private sector in these activities. A review of ranking by enabling environment scores (as opposed to total score) suggested that in most cases those that ranked highest by total score also fell within the highest rankings by enabling environment.

5.1.2 GNI

The GNI indicator, limited to 10% of the total score, had minimal impact on results; this is to be expected in that all countries are by definition weaker economies with low per capita incomes.

5.1.3 Enabling Environment

In considering the quality of the national enabling environment attention was focused on three main areas:

- The general attitude towards the importance of renewables, whether this is reflected in the national agencies; for example, are there specific agencies or institutions dedicated to renewables; particular incentives for renewable uptake and any form of regulatory “encouragement” towards the preferential use of clean energy within the power sector.
- The existence of specific policies and regulations that provide an attractive fiscal environment for the private sector; demonstration of a real willingness to engage with the private sector, through actual project implementation; broader government support for the

establishment of a vibrant national renewable industry and what has been achieved to date in these areas.

- The level of demonstrable engagement across the energy sector in moving to mainstream renewables; national and local strategies that drive the natural integration of renewables into electrification /electricity supply initiatives.

While a number of these issues were partially addressed within each EOI, independent reference was sought from a number of sources and the personal knowledge of members of the EG. During the interaction with the MDBs a number of these issues were explored in a generic sense but there was no attempt to seek specific comments on individual country situations.

What the EG took into consideration is that sound policy and regulation are fundamental requirements to provide a base for any sustainable integration of renewables into national energy; however what really demonstrates strength in this area is the existence of operational projects that include credible private sector partnerships.

5.1.4 Governance

The question of governance at a national level and within the renewables sector in particular is less easily quantified. There is wide experience within the development community of the issues that are faced by emerging economies through limited institutional capacity, reliance on political influence or domestic or international pressures to undertake projects that may not be in line with what might be considered a rational national strategy. The influence of such issues is difficult to quantify and not something that would be expected to be elaborated on within each EOI. While it is possible to draw some conclusions on such issues based on the successful completion of projects, often there is little documentation on these points.

The measures that were considered again included the outcome of recent projects; most of those that were donor funded were in enabling RE investments with some implementation projects on the side. By and large these were of a demonstration size affirming technologies as part of a transformative environment. Commentaries were provided in a number of EOI on the general perception of particular government agencies in the execution of these projects (and those that had stalled or failed); less detailed were the existence of clear and transparent procedures for the selection and pricing for energy projects.

Some assumptions were again made on the basis that if there was clear private sector participation in (government led or initiated) projects that governance was at least adequate. A broader commentary on transparency and the ability to do business in-country was drawn from various international publications on transparency and ease of doing business and EG familiarity with the commercial environment in a particular country.

5.1.5 Capacity for Implementation

While the prior two criteria – enabling environment and governance – are a natural component of ability to implement, the EG sought to determine whether there would be adequate capacity within government and the private sector to execute any projects that SREP might seek to fund. This

determination considered the volume of renewable projects completed to date, the level of private sector participation in such projects and whether or not past and current project activity suggested that additional investment through SREP would be effectively employed and provide a point of differentiation from other donors in the market.

The ability for governments to effectively utilise additional funds was judged in part by using a proxy of past and current levels of MDB financing for renewables. It was felt that a progressive growth in such associations with the MDBs was a fair gauge of the general acceptability by funders that a government was a responsible manager of financing in this market.

Given the public / private finance nature of SREP activities, and the desire that these funds be used to promote wider private sector participation, the potential that SREP funds might "crowd out" private sector was also contemplated, along with considerations of new or under-developed energy service niches for already successful RE technology deployments.

There is no question that the private sector has a critical role to play in the development of renewable resources, whether grid connected or off-grid. For example, the real growth of the solar PV markets within the emerging economies is testament to the importance of the private sector. However, with a few exceptions, these companies involved are generally small and often have limited financial resources, however it is recognised that the scarcity of public resources requires them to leverage and make a market for the more abundant private sector possibilities.

The EG would be concerned if the SREP funding created market distortions through large scale (non-commercial) public sector involvement that undermined the growth of the existing private sector participants. Rather the expectation is that the additional financing would be used constructively to expand the market through more effective engagement of the existing entities and an improvement in market access to finance, whether this is for service providers or end users, or both.

5.2 Points for Consideration based on EG Evaluation

Having undertaking the evaluation and ranking of the 40 EOIs in a relatively short period and with the need to make a mix of quantitative and qualitative assessments, the EG would like to highlight a number of points.

5.2.1 Use of a Scorecard

While the underlying issues that were considered in 2010 and in this evaluation were essentially similar, the use of a numerical quantification of ranking was beneficial to the process.

The EG is confident that the relative ranking across the 40 countries reviewed is consistent and reasonable. The process allowed consistency checks across the country reviews; initial reviews were allocated to members on a random basis; each evaluation was "defended" to the whole EG and those that were shortlisted, and on the margin, were re-evaluated by different group members then presented again to the full team to test for a balance in scoring; this allowed a consensus to be reached on each of the country rankings.

The EG believes that the use of a range for the "low – medium – high" ratings for the various areas of evaluation (see Sample Template) provided a fair gauge of the country approach to satisfying each criteria and allowed for the subjectivity of some of these criteria.

As already noted, the influence of the energy access criterion is significant in the rankings; a cross check against "enabling environment" scoring did however provide reassurance that the recommended countries were amongst those demonstrating better capacity to ensure effective implementation were they to receive SREP funding.

5.2.2 The EOI Process and Quality of Information

While it was important to be able to independently verify some of the points made within the EOIs, the quality of most and the general frankness of many provided a good base from which the EG could start its deliberations.

In addition to drawing on specific in-country experience and knowledge from within the group, the EG used a range of resources to test and supplement information provided in the EOIs. The recent activities within the international renewables market and a number of particular initiatives have begun to build a valuable collection of data on many of the countries that have been reviewed.

The EG sourced additional data from, amongst others, the following sources:

- Climate Scope 2013
- Energypedia
- IDA Country Performance Ratings
- IFC Ease of Doing Business
- IRENA
- REEGLE
- SE4ALL Gap Analyses
- Solar Solutions West Africa
- Transparency International

5.2.3 Differentiation between Ranked Countries by Size of Funding

During the first round of reviews by the EG it was made relatively clear by the Sub Committee that the interest of SREP was to consider opportunities where they could contribute funds of US$30 to US$50 million; small scale opportunities were therefore not favoured. At the present time it is recognised that there are no immediate funds for further large disbursements and that the initial support will be limited to the costs of preparation of the Investment Plan for selected countries.

In the current round, and using the underlying criteria proposed by the Sub Committee, countries with small scale needs have been ranked amongst the top group; in one case for example a country has a high level of (renewable) electrification but is seeking support to eliminate the remaining dependence on imported diesel fuel by developing an indigenous biofuel resource.

In addition the EG has not chosen to discriminate against countries that may have a higher level of access and also a well-established enabling environment and strong ongoing private sector involvement; in these cases there could be an argument that these countries have adequate resources and SREP's additive benefits would be limited. However in such cases there is also a counter argument that given their progress these countries could make good use of SREP funds, having already demonstrated their capacity to implement significant projects. In considering whether these countries should remain in the upper ranking, it is suggested that the number of potential beneficiaries, rather than a simple percentage of the population, should be also be taken into account.

5.2.4 Preparation of Investment Plans

The EG recognises that the SREP procedure normally requires that a country prepare a full country Investment Plan (IP) to allow consideration of a final funding commitment by the Sub Committee. In many cases this a valuable exercise, particularly for those countries which are at an early stage of assessment of their energy needs and development of an appropriate strategy to address these.

However, some countries recommended as potential new pilots are already well advanced in this process and it is questioned whether a full IP would be required (or even beneficial) or whether a more focused project funding request might be more appropriate.

5.2.5 MDB Input to Selection from Recommended Countries

Although it is understood that the MDBs have not necessarily been directly involved in the preparation of EOIs, it is anticipated that they will be able to contribute valuable input at the Sub Committee level. From the discussions with the MDBs, held during the week in Washington, it was apparent that there are some variations across the MDBs in terms of their appetite for investment (under SREP) in particular countries. However it was not felt appropriate to seek their disclosure at this stage on any country that might be excluded; it has been assumed (and confirmed by at least one of the MDBs) that this will be an input they will reserve until discussions on the choice of new pilots by the Sub Committee at their meeting.

5.2.6 Political Considerations

The EG acknowledges that there may be domestic and external political considerations that will influence the interest of MDBs in working with certain countries and/or may see a more general withdrawal of support by the wider donor community. The EG has chosen not to speculate on such matters but recognises that some of the countries on their list of recommendations may be rejected because of such issues.

6.0 RECOMMENDATIONS

On the basis of the analyses undertaken and summarised in 4.0, the EG recommends that the following countries be considered as new pilots, subject to the comments and caveats as noted and elaborated in 5.0.

6.1 Africa

Recommended Countries:

Ghana	Note that Ghana has made considerable progress towards the uptake of renewables and the engagement of the private sector
Uganda	A number of donors and MDBs are considering withdrawal of funding from Uganda as a reaction to recent human rights issues
Rwanda	
Madagascar	
Benin	
Malawi	
Sierra Leone	
Lesotho	

Reserve countries:

Zambia
Niger
Democratic Republic of Congo

6.2 South and East Asia and the Pacific

Recommended countries:

Bangladesh	Note that Bangladesh has made considerable progress towards the uptake of renewables and the engagement of the private sector; the proposed project would however benefit a significant population. If selected it would seem that the requirement for a full Investment Plan might not be necessary nor particularly beneficial.
Kiribati	Note that Kiribati is seeking modest funding to explore biofuel substitution for diesel and any project will benefit a relatively small (but vulnerable) population

Reserve:

Cambodia

6.3 Latin America and the Caribbean

Recommended countries:

Nicaragua
Haiti

6.4 Europe and Central Asia

On the basis of the analyses undertaken, no countries from Europe or Central Asia are recommended for inclusion as new SREP pilots.

7.0 SUMMARY COMMENTS ON RECOMMENDED COUNTRIES

The notes that follow are largely edited extracts from the EOI of the recommended countries. They are provided by way of a synopsis of the underlying information that was used to rank countries and also to provide context around the approach to SREP for consideration as a pilot. In particular the stated reasons for the specific support sought from SREP are included to indicate the focus and scale of what is being sought.

The full EOI contain significant additional information, tabular and graphical information which has been cut in preparing these abbreviated summaries.

7.1 Africa

7.1.1 Ghana

The Energy Sector Overview & Challenges

The Ministry of Energy and Petroleum (MoEP) oversees the energy sector, and is responsible for energy policy formulation and implementation. Power Sector Reforms (PSR) began in 1994 to accelerate expansion of infrastructure in line with the country's socio-economic development agenda. Since then, the PSR has enhanced transparency in the regulation of the sector and opened it up to private sector participation by dismantling the vertically integrated utility structure and availing the generation and distribution aspects of the industry to market competition.

The implementation of the reform process has resulted in the current unbundled structure with separate operational functions in respect of power generation for the Volta River Authority (VRA), transmission for the Ghana Grid Company (GRIDCo) and distribution for the Electricity Company of Ghana (ECG) in the Southern zone of Ghana, and Northern Electricity Distribution Company (NEDCo) in the Northern zone.

The sector has, since 1997, been regulated by the Energy Commission (EC) which is the technical regulator responsible for licensing and advising the Ministry of Energy on policy issues; and the Public Utilities Regulatory Commission (PURC) which is the independent economic regulator responsible for approving and setting tariffs in the power sector.

Energy Generation and Access Situations

Generation capacity is 2800MW, and the target is 5000MW installed capacity by 2016 with renewable energy contributing 10% to the generation mix by 2020.

Grid extension is carried out in accordance with the National Electrification Scheme (NES). Access to electricity is 72% nationwide in 2010, even though it is less than 50% in the three northern regions of the country. Universal access to electricity by 2020 is now advanced to 2016. In terms of service reliability, the average forced outages per customer per year currently stand at 40 hours / customer / year (h/c/y) in urban areas and 66 h/c/y in rural areas.

The Challenge of Achieving Universal Access

Majority of the remaining 28% of the country's population (about 7 million) lives in deprived

rural communities including those along the Volta Lake and the Islands created by the Akosombo Dam. These communities are the most difficult and uneconomical to electrify through national grid. The challenges posed by the electrification of these communities are now seen as a significant hurdle in the country's goal of achieving universal access by 2016. Preliminary results of ongoing World Bank funded GIS assessments of the Lake Volta region alone shows that there are over 200 inhabited islands and 2000 lakeside communities which are not likely to be connected to the National Electricity Grid.

Renewable energy-based electrification solutions are strongly being pursued as the way forward for these communities. Many development partners, including the African Development Bank, State Secretariat for Economic Affairs (SECO) of Switzerland and the World Bank are supporting the Ghana Energy Development and Access Project (GEDAP) for which one component is meant to promote a mix of renewable energy based models including 4 pilot mini- grids to serve nearly 100,000 people in some of these deprived communities. The Ministry of energy is leveraging resources and lessons from the ongoing initiatives to develop the necessary frameworks, scale-up and accelerate rural electrification using renewable energy.

The Country's Renewable Energy Potential

The proven renewable energy resources are biomass, solar, wind energy, waste-to-energy and hydro. The MOEP is committed to the sustainable development and utilization of these resources to address energy access issues, contribute to the fight against climate change, sanitation problems, and create sustainable green jobs for Ghanaians.

Hydropower is still the most important renewable energy source accounting for about 60%-70% of electricity generation capacity, if large hydro is counted. Plants below 100MW are considered modern renewable energy by ACT 832 and there are 17 potential sites in the country. There are also about 22 exploitable mini-hydro sites with total potential between 5.6MW – 24.5MW.

Solar energy plays a significant role; from electrification to agro-processing. The Solar irradiation levels range from 4.5-6.0kWh/m2/day with the highest irradiation levels occurring in the northern half of the country. Over 38,000 solar home systems and lanterns have been Installed in more than 120 communities throughout the country for off-grid applications and 25 grid-tied installations with total installed capacity of ca. 4MW.

Wind energy potential exists. Average annual wind speeds along the coast and some islands range from 4-6m/s at 50m hub height. This potential can support utility scale wind power and hybrid micro/mini-grid development.

Biomass resource includes agricultural to forest wastes/products. A recent World Bank funded study on Agro - Processing and Sawmill Wastes Assessment for Electricity Generation 2014 revealed that there are well over 30 major/clustered agro, wood processing sites in Ghana generating nearly 10,000 ton/year of agro and wood processing wastes alone.

Rationale for Selected Sectors for SREP Finance

The main barriers facing the scaling-up of renewable energy based electrification to a wider Population in Ghana are:

- Lack of financing,

- Payment of low electricity tariffs,
- Difficulties in enforcing approved regulatory and legal frameworks,
- Weak local capacity to operate, maintain and manage such facilities and inadequate funding for projects.

Efforts to address the lack of financing

- Engagement of local banks to develop renewable energy financing portfolios,
- Development of the renewable energy fund and proposed levies to support renewable energy initiatives.
- Exploring external funding opportunities such as World Bank, Climate Funds, EU Energy Facilities, etc.

Efforts to address non-cost reflective tariffs

- Upward adjustment of electricity tariffs to the tune of about 78%
- Review and implementation of the automatic adjustment tariff system
- Support for electricity distribution companies to reduce technical and commercial losses

Efforts to enforce regulations

- Support for the Energy Commission and PURC to fully implement its core mandates,
- Development of relevant policy tools such tariff setting program, licensing procedures and guidelines, etc. in line with the Renewable Energy Act, 2011, and resourcing key agencies to implement them.

Efforts to address weak human capacity

Bilateral arrangements with development partners such as Chinese, Japanese, Indian governments, European Union, to build short and long term capacities in renewable energy

- Support for technical, vocational and tertiary institutions in Ghana to develop and run curricula in renewable energy. Business Develop Support (BDS) for the private sector to play vital role in the provision of renewable energy solutions in the market.

While the MOEP is already very active in addressing the barriers to renewable energy development, much more efforts are required to meet the at least 10% target of renewable energy by 2020 and universal access. In that context, MoEP intends to use the SREP Financing to leverage other funding facilities, especially those under the Ghana Energy Development and Access Project (GEDAP), to undertake the following prioritized renewable energy initiatives.

- Further electrification of 46 additional communities in the immediate vicinity of Lake Volta using micro/mini-grid renewable energy systems. Based upon the pilot exercise currently under evaluation, these 46 villages will cost in the range of US$35 to $38.5m to electrify and will provide connections to between 15,500 and 25,500 households or roughly 93,000 to 155,000 people and add close to 16MW of installed renewable energy capacity. In addition, roughly 350 public facilities (100 clinics, 200 schools and 50 security posts) will be electrified through this initiative.
- Construction of the 60kW Tsatsadu micro hydro project.
- Support for facilitation of waste-biomass cogeneration and other promising activities identified under the current GEDAP program.

  Develop human and institutional capacities for decentralized renewable electrification.

- Development relevant policy tools and business model (Community IPP Model where the grid/distribution infrastructure would be owned and managed by the Government and IPP will generate mini power and sale to customers).
- Develop the framework and strategies for the creation of Renewable Energy Authority to manage the industry to ensure post project sustainability as provided in the renewable energy Act 2011 (Act832).
- Given the technical assistance needs of getting this work underway, the MoEP is requesting US$50m from the SREP fund.

Enabling Policy & Regulatory Framework

The National Energy Policy (Renewable Energy Sub-sector Policy

The goal of the renewable energy subsector is to increase renewable energy in the total national energy mix to 10% by 2020, ensure its efficient production and use.

The policy focus therefore is to promote the development and management of renewable energy resources with the view to increasing energy access, combat climate change and contribute to the attainment of:

- Ghana Shared Growth Development Agenda.
- ECOWAS White Paper for Energy Access
- UN Millennium Development Goal
- Sustainable Energy For All Initiative

The Renewable Energy Act 2011 (Act 832)

In December 2011, the Renewable Energy Act 2011 (Act 832) was created to provide fiscal incentives, regulatory framework for the promotion and attainment of at least 10% of renewable energy in the generation mix by 2020. The key provisions of the Act 832 are the following.

- Feed-in-tariff scheme under which electricity generated from renewable energy sources would be offered a guaranteed price.
- Renewable Energy Purchase obligation under which power distribution utilities and bulk electricity consumers are obliged to purchase a certain percentage of their energy required from electricity generated from renewable energy sources
- Off-grid Electrification – promote Mini-grid and stand-alone RE systems for remote off-grid rural electrification.
- Licensing regime for commercial renewable energy service providers among others to ensure transparency of operation in the renewable energy industry.
- Connection to transmission and distribution systems which obliges the operators of the transmission and distribution systems to connect a generator of electricity from renewable energy source within the coverage area where a generator of electricity from renewable energy sources so request
- Net-metering which provides incentives and allows for the integration of renewable energy into the distribution network through own-consumption and export of the Excess into the networks.

7.1.2 Uganda

The Energy Sector Overview & Challenges

The country's economy is predominantly agricultural with the country Gross National Income (GNI) per capita at US$549 in 2011. In the last 20 years, the economy has been growing fast creating high

demand for modern forms of energy. Real Gross Domestic Product (GDP) grew by 6.7% in FY 2010/2011. Uganda has surpassed the 2015 MDG of halving the 56% poverty rate recorded in 1993 to 24.5% by 2010. Uganda's vision 2040 sets out an electricity access target of 80% by 2040. Uganda's National Development Plan (NDP) covering the period 2011-2015 highlights the urgent need to increase access and usage of electricity through investments in least cost generation, promotion of renewable energy, energy efficiency, and the development of associated transmission and distribution infrastructure.

The energy balance comprising of biomass 88.9% (fuel wood 78.6%, charcoal 5.6% and agricultural residues 4.7%), petroleum products contribute 9.7%, and electricity contributes only 1.4% of the total national energy balance . Most of the fuel wood is used for cooking utilizing the highly inefficient three stone cook stoves especially in the rural areas where most of the population lives. Access to electricity stands at 14% nationally and in rural areas it is at 7%. Per capita electricity consumption remains one of the lowest in the World at less than 100kWhrs per person.

Uganda had always used hydropower as the main source of electricity until 2005 when thermal power plants had to be introduced to the national grid to address an acute shortage of power which had come about due to poor planning arising from a history of internal conflict. Installed power capacity currently stands at 850MW including 100MW of thermal power. Uganda is endowed with abundant forms of renewable energy (biomass, hydropower, geothermal, wind, solar) but exploitation of this clean energy for socio economic development remains a challenge. The East African rift valley in which geothermal power has been exploited in Kenya has its western arm running through a big part of Uganda and there are clear surface indications of availability of geothermal energy.

In 1999, Uganda realized the need to attract private capital to its energy sector and reformed the power sector allowing for private sector participation. As a result of these reforms, Independent Power Producers (IPPs) are currently participating in electricity generation and have built one large hydro power plant (the 250MW Bujagali hydropower plant), 5 mini hydro power plants with a total installed capacity of 56MW, two cogeneration plants from sugar production plants, and plans to build a total of 150MW from renewable energy resources mainly focused on mini hydropower plants are now quite advanced with construction expected to start this year. Uganda has a renewable energy policy in place with renewable energy feed in tariffs published and in use with an independent power sector regulator. Hydropower development for grid connected systems is picking up with plans to build 600MW Karuma hydropower plant and the 183MW Isimba hydropower plant in advanced stages. However, geothermal power development remains a challenge and the need to address scale up of house hold and community based renewable energy for cooking and other household requirements is urgent. Uganda was selected as one the fast movers under the United Nations supported Sustainable Energy for ALL (SE4ALL) where increased use of renewable energy is one of the targets. SREP financing would contribute towards achieving these global objectives.

Uganda has established the Rural Electrification Fund (REF) which is managed by the Rural Electrification Board (REB) with the now ten year old Rural Electrification Agency (REA) as the implementing arm of the Government rural electrification agenda. Uganda has also established the Uganda Energy Credit Capitalization Company (UECCC) to promote financing for renewable energy development utilizing existing financial institutions and the Ministry of Energy and Mineral Development has a fully-fledged renewable energy division whose mandate is to promote renewable energy development. Implementation of SREP interventions would utilize these existing

structures.

Rationale for Selected Sectors for SREP Financing

Uganda experienced poor governance and internal conflict through the 1970s and the 1980s allowing hardly any progress in renewable energy development. Following return to stability and the reforms in the 1990s, there is visible progress in renewable energy deployment mainly utilizing private enterprise. Renewable energy deployment requires technology and capital. However for entrepreneurs to invest in renewable energy, they need information of the available forms of renewable energy (where is it, in what quantities and for what market) and a suitable investment climate with a clear risk allocation. Major barriers for renewable energy deployment in Uganda are various and vary with the form of renewable energy and include the following:

(i) For geothermal energy the main barrier has been borehole drilling risks and lack of public funding to quantify the geothermal resource information to allow packaging of bankable projects for private sector investment. Geothermal investors fear the risk of drilling boreholes which could turn out dry. To address this risk, funds have to be found to drill the boreholes and once steam is established, private investors are attracted to develop the sites. Geological, geophysical and geochemical investigations have been carried out on several sites in Uganda with the support of International Development Association of Iceland (ICEIDA) and other development partners with clear indication of geothermal recourse availability but the next step of drilling boreholes to demonstrate availability of steam for power generation has not been done due to lack of funding. Detailed investigations have been carried out at Katwe-Kikorongo Kibiro and at Buranga Geothermal sites. Preliminary investigations have been carried out at other sites like Panyimur and Kanangorok.

(ii) For household energy utilization the main barriers have included lack of adequate mobilization to allow change in attitudes (use of energy efficient stoves and use biogas resources), information with supportive data to support household and community renewable energy areas as viable investment destinations, lack of knowledge by local communities on benefits and advantages of utilizing better energy methods, high upfront costs for project developers and for end user consumers, and technical capacity to develop and sustainably utilize these renewable energy resources at household level.

In terms of prioritization of renewable energy interventions in Uganda under SREP, geothermal development for grid connected power supply is high priority. In neighbouring Kenya, geothermal resources have been deployed with excellent results. In Uganda surface exploration has been done and the next step is required to drill boreholes to demonstrate availability of steam for power generation. The impact of geothermal would be big given that it would be connected to the grid and replace fossil fuel thermal power plants and prevent establishment of new thermal power plants. Availability of geothermal power would contribute to national socio economic development and create jobs for the population utilizing clean energy. Uganda relies heavily on hydropower whose available capacity is heavily affected by climate variability. Geothermal power is less impacted by climate change and would provide the necessary stabilization in the grid energy mix. For one geothermal area, at least three boreholes are required at an estimated cost of 3 x US$6m = US$18m. Fortunately, these geothermal sites are close to the recently established oil fields where drilling rigs are now available. Use of these rigs could reduce on the cost of geothermal drilling.

The second potential area is scaling up of household renewable energy addressing cooking requirements at household and at institutional level (schools and health facilities), renewable energy for lighting, and renewable energy to support communication and core productivity. In Uganda, close to 95% of all schools are still using the three stone fire places and most head teachers are not aware about improved stoves and their cost effectiveness. The school is a learning environment where practical renewable energy use should be demonstrated to groom a new generation which fully appreciates renewable energy use. At a National level the biomass consumption for cooking in institutions takes up over 2 million tonnes of wood per annum. Through adoption of improved cook stoves this consumption can be reduced to 50% or lower. Upfront funding is a main barrier. There is a need to develop a number of innovative funding mechanisms to address renewable energy requirements at household level including community and institutional level such as grants, challenge funds and use of carbon credits as collateral. After attaining a dissemination of certain critical mass in terms of number of units and assemblers / manufacturers, the renewable energy industry can become self-sustaining and subsidies can be gradually withdrawn without any adverse effects on continued dissemination of the stoves. In Uganda, the mobile phone has taken communication to the most remote areas of the country. Other Information, Communication Technologies (ICT) are following allowing the farmers to explore better opportunities to improve their livelihoods through search for better markets, farming technologies, and obtaining global linkages. This ICT revolution requires modern energy to power it. Renewable energies like solar systems, biogas and biomass systems, off-grid pico hydro and micro hydro, as well as small scale community based wind systems would support the rural communities improve their lives. The main challenge is financing for technology vendors and users. Utilizing the Uganda Energy Credit Capitalization Company and the microfinance structures which are already established in Uganda innovative financing structures coupled with a targeted public information system would be put in place to cause scale up of these renewable forms of energy.

Enabling Policy and Regulatory Environment

The Energy Policy for Uganda dates back to 2002 and aims "to meet the energy needs of the Uganda's population for social and economic development, in an environmentally sustainable manner". With this policy the Government aims to increase and improve modern energy supply and it shows a commitment of the Government to develop and use Renewable Energy resources and Energy Efficient technologies.

The applicable law is the Electricity Act (1999) whose purpose was to enhance efficiency through Privatization and liberalization of the sector and provides for an independent regulator, the Electricity Regulatory Authority (ERA). Other applicable laws include the National Environmental Management Authority (NEMA) Act, the National Forest Authority (NFA) Act and the Constitution of Uganda.

The Renewable Energy Policy (REP) for Uganda was published in 2007 and recognizes that a number of renewable energy technologies have become commercially viable and, need to be brought into the national energy supply mix. The policy lists four major challenges the Government had faced in meeting the energy needs of its people:

- The unprecedented electricity deficit of about 165MW on the national grid due to the fall in Lake Victoria water levels as a result of prolonged drought. This necessitated the installation of 150MW of thermal (diesel) generation to bridge the gap.
- The escalating oil prices on the international market

- To make electricity accessible to the rural population through grid extension as well as small scale renewable energy generation using micro and pico hydro, PV systems, wind power and biomass.
- The Government's obligations on greenhouse gas emissions to contribute to the global fight against climate change. In particular, Government wants to provide the necessary framework for private sector investors in renewable energy projects to benefit from the available facilities for emissions trading.

The Renewable Energy Policy set a target to increase the use of modern Renewable Energy from 4% to 61% of the total energy consumption by 2017. It recognized the barriers to Renewable Energy development including high upfront costs, inadequate legal and institutional frameworks, limited technical and institutional capacity, limited awareness and irrational utilization of biomass resources among others.

The key feature of the Renewable Energy Policy was the publication of Standard Power Purchase Agreements and a Feed in Tariff for grid connected renewable energy systems with the aim of reducing the transaction time and to raise the levels of predictability of the investment environment for RE projects that were then below 20MW. The Feed in Tariffs are reviewed periodically to reflect the costs changes over time.

7.1.3 Rwanda

The Energy Sector Overview & Challenges

The present electricity supply in Rwanda is derived principally from thermal and hydropower sources. Electricity access in Rwanda is still low. It is estimated that currently 18% of the population has access to electricity supplies. In addition to lack of access to electricity, the high retail tariff for electricity is an impediment to growth of demand for electricity in the country.

Rwanda has variety of potential energy resources from biomass, hydro, solar, petroleum, methane gas, wind and geothermal.

The analysis of supply and demand of energy in Rwanda indicates that today approximately 85% of primary energy still comes from biomass, in the form of wood that is used directly as a fuel (57%) or is converted into charcoal (23%), together with smaller amounts of crop residues and peat (5%). Of the 14% of non-biomass primary energy, petroleum products account for 11% (used mainly in the transport sector) and electricity for approximately 4%.

Due to increasing energy demand of the modern sector, the search is underway for other sources of energy. In addition to the option of expanding the capacity for hydro- electricity and solar energy, the government is supporting the development of methane gas of Lake Kivu and Geothermal exploration studies. There is also an estimated 155 million tonnes of peat reserve.

The Hydropower Atlas has identified 70 hydro sites in the country with a combined capacity of 15 MW. Future domestic generation developments for the main grid are expected to continue from both hydropower sources and thermal (heavy fuel oil and methane based production from Lake Kivu). Geothermal and wind power resources are also being investigated with initial geothermal estimates suggesting that further investigation of geothermal potential is warranted.

Enabling Policy & Regulatory Framework

The EDPRS II covers the period 2013-2018, and is the medium-term framework for achieving the country's long term development aspirations as embodied in the Rwanda Vision 2020, and the intermediate targets of the 2015 Millennium Development Goals (MDGs). An Energy Sector Strategy has been developed to support sustained growth of the economy, and raise the standard of living for the Rwandan people by improving access to modern forms of energy at the household level.

NATIONAL ENERGY SECTOR STRATEGIC PLAN (2008-2020)

This is a detailed roadmap of investments which will allow meeting of the energy requirement.

Rationale for Selected Sectors for SREP Finance

BIOGAS

One of the long-term strategies of the EDPRS II is to reduce fuel wood consumption from 94% to 50% and one of the major contributing factors will be the installations of Biogas digesters in both residential homes as well as the institutions with large population of citizens like, schools, hospitals, prisons etc.

The Biogas Programme in Rwanda started operations in 2007 under the Ministry of Infrastructure with financial and technical support provided by SNV, GIZ, formally known as GTZ and the Dutch Ministry of Foreign Affairs (DGIS) as the main donor. The programme's objective was to develop a commercial and sustainable domestic biogas sector, contributing to substitute mainly firewood, increasing agricultural production while applying bio-slurry, improving living conditions by reducing the workload and improving health and sanitation for mostly women and children, employment generation and reduction of greenhouse gas (GHG) emissions.

With enough funding and support from SREP, Government of Rwanda will be able to achieve the EDPRS II targets of reliance on the fire wood and charcoal which will be mostly replaced by Biogas digesters at both levels of domestic and institution.

MICRO HYDROPOWER PLANTS

There has been a growing realization that electrification through mini/micro hydropower plants (MHPP) can play an important role in increasing the generation capacity in Rwanda as well as promoting the socio- economic development of remote rural areas. To date, the majority of the mini/micro hydropower projects in Rwanda have been promoted through public schemes, which are financed by the Government of Rwanda (GoR) or by international development partners and operated by the public utility, Energy Water and Sanitation Authority Limited (EWSA Ltd).

Hydro power, where correctly sited, can deliver an economic supply of base-load power. Government of Rwanda plan to develop around 70 MW of domestic Hydro projects between now and 2018. The individual nature of each Hydro site necessitates a feasibility study be carried out in advance of development or contracting with the private sector. Its overall potential is estimated to be somewhere between 400 and 500 MW and the current installed hydro capacity is approximately 60 MW. As a result of extremely low operational costs however, hydro is still one of the cheapest forms of generation in the long run.

In pursuant of the National objective to increase the installed capacity from the current 110 MW to 563 MW by 2017, the GoR, through the Ministry of Infrastructure and Energy Water and Sanitation

Limited (EWSA Ltd) is committed to utilize every means and resources to develop projects that will make this mile stone achievable. This ambition has become even bolder in that around 32 MW is expected to be achieved in the next 6 Months to come, from on-going hydropower projects. In order to achieve this target, (EWSA Ltd) has selected around 69 potential micro and Pico hydro sites totalling approximately 15 MW of estimated total capacity (in the capacity of 500 kW and less). Feasibility studies for these sites are currently underway on a number of sites. These studies are expected to be completed in Mid-2014. Upon their completion some will undertake a competitive bidding process to identify a private sector partner while others will be developed through public funding.

As part of Private Sector participation and encouragement in the energy sector activities, the Government of Rwanda through EWSA Ltd is planning to deliver some of its operational mini-hydropower plants to private operators. Currently only one plant (Rukarara I (9 MW)) have been placed under private management. The generated income from these plants will be used for development of the other mini/micro-hydropower plants.

Barriers associated with hydropower development and operation in Rwanda is mainly the low participation of private sector in the development and operation of the plants. To overcome this, the Government have decided to develop and then transfer them to the private sector for operation, this incentive is expected to boost their participation as the involved risks will be minimised.

A grant from SREP is essential to complement public financing in order to construct a number of micro-hydropower plants (some from a pool of the above mentioned 69 sites) and then transfer them to private operators in a form of as a way of reducing risks, support and encouragement to private sector participation in the electricity generation. The transfer agreement is in a form of renting where the private investors pay the rental fees to Government in instalments at a specified period of time. The generated income from these transfers will be used for the development of new sites.

SOLAR ENERGY

It is possible for people to access electricity without the need to connect to the Electricity grid network. In such instances electricity is provided through off-grid solutions ranging from solar lanterns for lighting and charging phones to power from small hydro installations. These solutions will not provide the voltage or the stability provided through a grid connection but are often far more economical for low usage consumers due to reduced capital costs. Government plans to ensure that 52% of households have electricity from either of the two off-grid (hydro and solar) systems by 2017/2018. The Government also plans to extend coverage to the other 48% of the households, to the grid network by 2017/2018.

Currently only 20% of the schools in Rwanda have access to electricity and these schools are located within a radius of less than 5Km from national interconnected grid. More than 2000 schools have no access to electricity and are located at distances greater than 5Km from the national interconnected grid.

To ease the integration of ICT in education, the Government of Rwanda through the Ministry of Education, has initiated an ICT program in Education “one laptop per child” in primary schools

but the main challenge to date, is the lack of access to electricity.

Following the experience from the previous projects (like the on-going project of supplying and installing solar PV equipment in 300 rural schools located at distances greater than 5km from the national interconnected grid), solar energy can be used as a source of electricity required by "One Laptop per Child" program, in rural primary schools. It is in this regard, that the Government of Rwanda would like to electrify more schools with Solar PV systems as a part of a the current country wide campaign of achieving 100% electricity access by 2017/18 as outlined in the "Energy Sector Strategic Plan Roadmap 2013-2018".

To achieve this, each primary school will be equipped with a PV array of at least 2.5 kWp that will provide sufficient electrical energy for IT equipment and lighting. Solar PV installation includes; PV modules, Charge regulators, Solar batteries, Inverters, lightening arresters, Differential circuit breakers, Junction boxes, Compact Fluorescent Lights (CFL) and other accessories such as cables, plugs, switches, supports etc.

SREP funding will be able to complement the other Government of Rwanda internal financing mechanisms and efforts to make sure this target of solar coverage to all schools is achieved in line with the national energy strategy.

7.1.4 Madagascar

The Energy Sector Overview & Challenges

The energy sector occupies a critical role in the economic and social development of Madagascar. Today, very few people in Madagascar have access to modern sources of energy, and those live mostly in urban areas. The electricity access rate for the country was estimated at 12% (4.8% in rural area) in 2013. People who do not have access to modern sources of energy use inefficient energy sources (like kerosene), which are often polluting and unsafe, and for which they spend much more than the few privileged people who have access to modern sources of energy. The average energy consumption is 0.315 TOE/capita/year.

Wood energy (including wood and charcoal) represents 93% of the total energy supply in Madagascar in 2012. About 7.5% come from petroleum products which are all imported; this represents an increasing burden for the national budget. The electrical energy, supplied by hydro, solar, and wind, represents 0.001% of the total energy supply in Madagascar.

The electric power production is 506 MW, of which 165 MW is attributed to hydroelectric sources. The remaining 341 MW is obtained from conventional power stations (diesel), 27 kW from solar power, 157 kW from wind, and 40 kW from biomass. In terms of electricity production, the part of hydropower is 54% of total production in Madagascar.

Renewable Energy Potential

Madagascar has a great potential in terms of renewable energy; however, very little has been harnessed so far:

- In terms of solar energy, many regions of the country have more than 2800 hours of annual sunshine. With an average of 2000kWh/m²/year, Madagascar is among the richest countries in solar energy potential in Africa. The average horizontal insolation

is 5,5kWh/m2/day, across the majority of the land area. Solar Photovoltaics (PV) in particular are currently utilized for powering public buildings such as health clinics, as well as an off-grid rural electrification solution.

- Regarding the wind potential, in general, the northern part (around Antsiranana) and the southern part (around Taolagnaro) have wind speeds more than 7m/s (50 m high) favourable to electricity production.
- The theoretical hydropower potential of Madagascar is estimated at 7800 MW. However, only 165 MW of this is currently exploited, indicating the very high potential for further hydropower utilization. Madagascar currently has 7 hydro-electric power plants, as well as 11 small-/micro-hydro plants.
- In terms of biomass, biomass in the south has been identified as having high potential for energy production. Sugar production is high, and bagasse co-generation is common. Investment projects in the field of biofuels are also identified; this is favoured by the law governing the ethanol industry which was adopted in 2013.
- Madagascar is believed to have a geothermal potential but the exploration is still at an early stage.

Renewable Energy Policy and Targets

There is no specific renewable energy policy in Madagascar. However, one of the key objectives of the Ministry of Energy is to increase the electricity access rate, and make it affordable to the population, through tapping the renewable energy potential of the country, thus offering a guarantee of sustainability. The Ministry of Energy is therefore currently
Working with the European Union to develop new policies that will:

- Develop a new renewable energy framework for the national utility (JIRAMA) and facilitate private investment.
- Encourage the predominance of renewables in the energy mix, at least 5%, 20% and 80% respectively by 2020, 2030 and 2050 – with a focus on the both small and large scale hydro and the development of alternatives sources;
- Ensure the sustainable use of natural resources.

With 80% of the national population living in rural areas, the development of rural electrification will be key for the development of the country. A national rural electrification policy was thus developed, endorsing the creation of the Agency for the Development of Rural Electrification (ADER).

Rationale for Selected Sectors for SREP Financing

In this context, the Government of Madagascar has set itself the goal to develop electricity infrastructure: "We must have the means of our growth by developing our infrastructure, like all transport but also the electrical infrastructure, as electricity for all, is the way to provide the means resources of modernity for the country with a significant contribution of renewable resource to the energy mix.

However, this objective meets the following major constraints:

- Lack of coordination between the institutions and agencies active in the sector, as well as with departments of other sectors;

- Lack of coordination between institutions, government agencies and private actors involved in the development of renewable energies;
- Weaknesses in the operationalization of the regulatory framework;
- Weakness of energy planning process and the evaluation monitoring system for renewable energy;
- Insufficiency of financial resources to face to high investment costs of renewable energy technologies;
- Limited technical and human resources capacity in the energy sector, and more specifically in the renewable energy sub-sector;
- Lack of private sector mobilization.

The Government of Madagascar intends to use SREP financing to overcome some of these critical bottlenecks in order to facilitate the large-scale development of renewable energies. For instance, the SREP funding will be used to buy down the capital costs of renewable energy investments leading to more competitive electricity tariffs, thus making projects more sustainable. To achieve this objective, the Government considers the option of launching competitive bidding call programs in order to attract the best private sponsors and drive the tariffs down.

Based on the information provided in the sections above, in terms of level of energy access, renewable energy resources and main barriers that need to be addressed in the sub-sector, the Government of Madagascar considers that SREP-funded interventions could complement

- The strengthening of the governance of the energy sector:
  - transparency in energy planning
  - strengthen logistics and more specifically RE equipment;
  - continue the institutional and regulatory reforms, especially those dedicated to the RE sub-sector;
- Undertake RE assessment for mini-hydro and biomass resources; and prepare pipeline of bankable feasibility studies for RE projects, etc. This also includes the extension of
- The ESMAP program to other fields: solar and wind power.
- Design programs to meet the needs of rural areas, including mini-grids and off-grid options with mini-hydro, solar PV and biomass technologies according to the sites selected.
- Developing a solar PV power plant in the southern part of Madagascar, with private sector involvement.

Enabling Policy & Regulatory Framework

The sector is regulated by a number of policies and laws. The energy sector policy aims at:

- Energy access for all, with sufficient availability to meet the needs and affordability;
  - Security of energy supply in quality and quantity;
  - Energy sector development, with a vision of sustainable exploitation of natural resources.

The law No. 98-032, passed on 20th January 1999, reforms the electricity sector and promotes private investment and competition in the sector. As part of its implementation, the legislation allowed the liberalization of the different activities on the sector, as production, transport and

distribution functions. In this context, a revision of the statutes of the key sectorial institutions (including the national utility JIRAMA) is already underway. The objective is to increase efficiency in the sector.

A regulator was created, the Board of Electricity Regulation (ORE), in order to regulate the sector and facilitate the participation of Independent Power Producers.

For the mobilization of the private sector, the regulatory environment is relatively favourable to energy investments in general.

7.1.5 Benin

The Energy Sector Overview & Challenges

The national context appears a national relatively low energy consumption, marked by a predominance of traditional uses of biomass energy: consumption of firewood and charcoal represents about 49.5% of total final energy consumption in 2010, petroleum products 48.3% and electricity 2.2%.

Energy consumption structure by sector dominated by households and transport: By sector of activity, the structure of energy consumption is marked by a predominance of the household sector (53%), followed by transport (36%) because of the consumption of petroleum products, and services sector (9%). Energy consumption in the industrial sector remains the lowest (2%) because the limited development of the industrial fabric.

Low access rates to electricity, especially in rural areas: In 2012, the national electrification rate is of 28.2% with 54.9% in urban areas and 4.5% in rural environment. The coverage rate is of 41.6% in 2013. Electricity consumption per inhabitant which is also very low is of about 110 kWh / inhabitant / year.

A strong dependence on energy from the outside: Benin is heavily dependent on external sources for its energy supply. 100% of consumed petroleum products are imported; Benin does not yet have an oil refinery. 90% of the electricity consumed in 2012 comes from the outside.

Electricity: A Poorly Developed Sub-Sector: Benin has a low capacity for production of electric energy, which indicates its high dependence on neighbouring countries (Ivory Coast, Ghana and Nigeria) to satisfy electricity needs. The electricity supplied to consumers is subject to problems of load shedding that occurred for more than 50 days in 2012. Currently, the deficit in the supply of electric power is about 50 MW. In fact, the average demand is 190 MW in 2012 while the supply of available electricity hardly reaches 140 MW. In 2013, peak demand reached 210 MW.

Potential of the Energy Sector

Based on the potential sources of recoverable renewable energy in Benin, it is possible to set minimum targets of 25% of renewable energy in the national energy mix by 2025. This can be achieved by the development of potential bioenergy, hydro, solar and wind energy.

Bioenergy Potential:

- Gar*bage*: They exist in large cities in significant quantities and their recovery should be considered for the development of capacities for electrical energy production to be injected into the supply network. The value in developing this sector involves various fields as energy, economy, health and environment. According to studies by the City Hall of Cotonou, the city would generate more than 700 tons of garbage per day.

- *Residues of food processing*: Food processing plants producing cottonseed or palm oil release significant quantities of waste (hulls and cottonseed, palm or coconut husk and meal, etc...) which constitutes true energy potential. Companies such as FLUDOR, SHB installed in the Bohicon area already have plans to do so for a capacity of around 6 MW.
- *Biofuels*: the strategy for the promotion of biofuel chains in Benin was adopted by the Government in April 18, 2012. According to this strategy, Benin is expected to produce 1.15 billion liters of ethanol and 229 million liters of biodiesel by 2025 to cover the domestic market with a blend of 10% with gasoline and diesel, and replace 15% of wood energy in households with ethanol.
- Hydropower potential*:* Hydropower potential is rather significant. It is likely to be valued for increasing national capacity of electricity production, both for the development of hydropower plants of large, medium and small capacity and for building micro-hydro plants in rural areas. The 1992 study by Coyne & Bellier on Ouémé River revealed, inter alia, that the two (2) sites below may be subject TO hydroelectric developments. These sites are Bétérou Amont (23.2 MW, 70 GWh) and Olougbé Ter (29.5 MW, 72 GWh). Other studies have revealed that Benin has many other sites that may be developed to house small hydroelectric dams namely for power less than or equal to 1,000 kW. Among these sites, six (06) were the subject to a feasibility study for their development.

- Solar Potential: The average sunshine in Benin varies between 3.9 kWh / m² / day in the south to 6.1 kWh /m² / day in the North. The sunshine is higher in the north of the country than in the south.
- Wind energy potential: Wind speed measured at an altitude of 10 m of varies from 3 to 5 m / s. However, there are more favourable areas in the northern region, in the center of country and in the southern region, that are likely to host wind turbines. In this context, it is necessary to perform a measurement campaign lasting at least one year on the most favourable sites at an altitude ranging between 40 and 60 meters. The wind map produced by ECREEE provides an overview of the windiest areas.

Enabling Environment for Renewable Energies

One of the objectives of government policy in the energy sector is to increase the production capacity of electric power in order to achieve a self-sufficiency of 70% by 2025, partially based on renewable energies. To demonstrate the commitment of Benin to the promotion of renewable energy, the Government enacted Law No. 2012-11 of 26 January 2012 authorizing the ratification of the Statute of the International Renewable Energy Agency (IRENA). In this context and to serve as an interface to IRENA created on January 26, 2009 in Bonn, Germany, the Government of Benin decided to create a National Agency for the Development of Renewable Energy and Energy Efficiency (ANADER) whose implementation is expected during this year (2014).

The vision of this sub-sector is formulated as follows: "Making renewable energy and energy efficiency, a factor in energy security, economic growth and poverty reduction."

The overall objective of the renewable energy policy is to encourage the development of renewable energy to meet the energy needs of Benin, and to provide equal access to services.

More specifically, the policy has the following objectives:

- Implementing favourable institutional, legal and incentive structures for the

development of renewable energy and energy efficiency;

- Developing national capacities for the production of renewable energy and energy efficiency in relation to the private sector;
- Developing and implementing a communication and awareness raising program for the development of renewable energies and energy efficiency in Benin;
- Developing applied research in the field of renewable energy and energy efficiency;
- Enhancing regional and international cooperation in the development of renewable energies and energy efficiency.

Enabling Policy & Regulatory Framework

In the sub-sector electricity activities are governed by two laws:

- The Benin - Togo Code of Electricity, bilateral agreement between Benin and Togo since 1968 and revised in 2003 specifically designed to open the sub-sector to independent producers and give the CEB the status of single buyer;
- The Act on the Code of Electricity in Benin adopted on 27 March 2007, which completes the Benin-Togo Code of Electricity and liberalizes the production and distribution of electrical energy in Benin and authorizes the signature of concession agreements with independent power producers.

The regulatory instruments of the electricity sub-sector are essentially the following:

- The decree N o . 2009-182 of 13 May 2009 establishing the responsibilities, organization and functioning of the Authority of Electricity Regulation;
- The decree establishing the Rural Electrification Fund (REF);
- The decree on the procedures for granting concessions for electrification

Rationale for SREP Funding of Specific Sectors

Energy Security

The electric power consumption of Benin is highly dependent on external supplies, which exposes the country to frequent power cuts, insecurity and recurrent energy crises.

Domestic production of electrical energy in Benin includes the energy produced by SBEE at the Yéripao hydroelectric plant (0.5 MW), located near Natitingou, and the energy produced by the thermal power plants. The domestic power generation capacity of Benin is still very limited today. Currently, SBEE production plant has an installed capacity of 81 MW. This capacity was recently increased by a dual fuel turbine of 80 MW. However, this domestic production capacity is not always available particularly because of the prohibitive cost of kilowatt-hour.

Today, the sector strategy is directed towards improving the energy independence of the country and diversifying its sources of supply, through the implementation of various interconnection projects with neighbouring countries and the enhancement of the national renewable energy potential.

Obstacles to the Development of Renewable Energy

The obstacles to the development of renewable energy in Benin are the following:

- the absence of an institutional and legal incentive framework for

developers of renewable energy;

- the relatively high initial investment costs of development of different technologies, for both the general public and family facilities;
- the absence of detailed design studies for the production of energy in the sub-sector of renewable energy, including wind, geothermal, and tidal power;

SREP Proposed Areas of Intervention

SREP intervention is required to help the implementation of the equipment plan for electricity production from renewable energy sources. This plan is developed based on the demand forecasts, the renewable energy potential available for the projects in the pipeline and the considered facilitations to be granted to private developers within the implemented legal framework.

Specifically, SREP support is requested to build the national capacity and strengthen the regulatory framework for a greater involvement of the private sector to support private developers of renewable energy which demonstrated interest in the construction of power plants in Benin and to develop projects for the promotion and development of large scale PV solar kits in remote rural households far from the network. These projects which aim at an increased contribution of renewable energy to domestic energy production and the promotion of an enabling environment for renewable energy are specified in the various areas as follows:

Project of small hydro power plants:

Project 1: Project for the development of mini and micro hydropower plants in Benin.

It consists in the implementation of projects related to the construction of the 6 small hydroelectric centrals as indicated in the Table 1 above. Feasibility studies are available and the estimated investment cost is 22.4 million USD. The projected installed capacity is 1.24 MW with an annual energy yield expected of 6.84 GWh.

Solar energy projects:

Project 2: Project to support private developers for the implementation of photovoltaic solar plants

The project aims to support private developers that have demonstrated interest in setting up solar power plants in Benin. Most of these promoters have conducted all feasibility studies and front end engineering designs. The proposed conditions of purchase and sale have so far repelled the promoters that expressed their interest. The project will support two (02) promoters and will pave the way for the development of public / private partnerships in the field. SREP funding will support the investment, the construction of lines to feed the network with IPP production and to mobilize land for the development of solar PV plants.

Estimated cost: € 27.25 million.

Projected installed capacity: 10 MWp (Tchaourou) and 6 MWp (Kandi)

Biomass projects:

Project 3: Project to build a biomass power plant with the private sector

The project has two components:

- Component 1: Support to agro-industry for energy recovery from industrial waste and / or agricultural residues: The oil companies Fludor and SHB have projects of power plants with a capacity of around 6 MW in the Bohicon area center of the country. There is a need to support the realization of these projects. Estimated Cost: to be specified. Projected installed capacity: 6 MW.

- Component 2: Support for the construction of a power production plant of 5 MW from household waste from Cotonou (Contractor: private sector)

Wind energy project:

Project 4: Design and development of a wind farm on the coast of Benin.

This project aims to increase the contribution of renewable energy sources, including wind turbines to domestic energy production. It will support one (01) of the developers having expressed their interest and conducted feasibility studies to establish a wind farm on the coast of Benin.

Rationale for the Solicitation of SREP Funds

Notwithstanding the emphasis on the development of renewable energy, there is little use of potential resources in Benin. This low utilization is due inter alia to:

- Initial investment is too high (in relation with the national capacity) and necessary for the development of clean technologies;
- The absence of a specific renewable energy tariff policy;
- The relatively still high cost of energy produced from the said sources and clean technologies (photovoltaic solar energy, biomass plants).

However, by developing alternative, sustainable and national solutions today, Benin will better tackle the energy challenges of the future.

Proposed projects offer the best options for energy production. But investment costs are very high. Concessional loans from multilateral development banks, the contributions of technical and financial partners and grants that may be mobilized under the SREP are necessary for the implementation of the ambitions of the energy sector. The SREP funding will mainly accelerate the infrastructure development of electricity generation from renewable energies. The conditions offered to investors for the development of the first projects will be more advantageous in the context of the SREP. Thus, these projects constitute a lever for development of clean energy technologies.

7.1.6 Malawi

The Energy Sector Overview & Challenges

Malawi is one of the least electrified countries globally, currently at 9% overall, and about 1% for the rural population. Comparatively, the sub-Saharan average is 10% for the rural and 25% overall. The current installed electricity capacity is 351 MW against a demand of 350MW. It is projected that electricity demand will be 598 MW in 2015, 874 MW in 2020 and 1,597 MW in 2030. Thus the supply and demand scenarios show a trend of significant capacity shortage in the foreseeable future due to an increase in demand averaging 7% per annum. The demand will grow mainly due to prospects in the mining industry.

Malawi's electricity is generated from hydropower stations (accounting for 98% of grid electricity) cascaded along Shire River which has of late been greatly affected by problems resulting from the degradation of the physical environment.

The country is currently not connected to power systems in neighbouring countries however, this option is under consideration. There are plans to interconnect with Mozambique for purchase of at least 50MW.

Wood fuel (firewood and charcoal) is the main source of energy for households in the country, accounting for about 90% of household energy demand. The heavy dependence on for fuel wood

has contributed to serious deforestation and degradation of the environment. Deforestation, in turn, has resulted in heavy river siltation creating further problems in the generation of hydroelectric power.

Renewable Energy Resource Potential

Malawi is well endowed with renewable energy resources which include good sunshine i.e. solar radiation of 21.1 MJ/m^2day throughout the year for photo-voltaic (PV) and photo-thermal applications, reasonable wind speeds (averaging 3 -7 m/s) adequate for water pumping and electricity generation, a number of perennial rivers with hydro power potential of 900MW, a reasonably large population of domesticated animals for biogas applications and hot springs for geothermal power generation.

Although renewable energy technologies (RETs) are now widely commercially available and their prices are increasingly competitive, Malawi has not been able to fully utilize them. As a consequence, the role of RETs in the total energy balance in the country has remained insignificant (0.2%).

Renewable Energy Policies

Currently, Malawi does not have a standalone Renewable Energy Policy. Renewable energy issues are covered in the National Energy Policy formulated in 2003. However, there is a draft Renewable Energy Strategy. The lifespan of the National Energy Policy is 5 years hence the policy is now due for review. This means that the draft Renewable Energy Strategy should also be reviewed to reflect changes that will be made in the revised energy policy. The policy will be revised this year (2014).

The contribution of renewable energy to the energy mix is less that 1%. The Ministry of Energy intends to increase the contribution to 7% by the year 2020.

The Ministry of Energy is encouraging the private sector participation in development and promotion of renewable energy technologies. The role of Government, through the Ministry of Energy, in renewable energy is confined to providing policy guidelines, developing strategies and providing institutional and capacity building support for market priming.

The Ministry of Energy has initiated pilot and demonstration installations of different applications of renewable energy technologies including solar home systems (SHS), biogas, wind energy for mechanical pumping, mini and micro-hydro. However, large numbers of these installations are non-operative despite being in absolute and high demand, mainly due to lack of maintenance.

Rationale for the Solicitation of SREP Funds

Barriers to renewable energy

The slow up take of renewable energy in the country is attributed to the prevalence of a number of technical and financial barriers, among others. Technical barriers include lack of capacity in manufacturing, distribution, installation and maintenance of RETs. Financial barriers include high initial investment costs. Other important financial barriers are: lack of dedicated and affordable financing mechanism; lack of financiers and suppliers knowledgeable about establishing dedicated financing mechanisms and appraising applications for credit; lack of skills to develop business plans; lack of knowledge about local, regional and international financial facilities for RETs; lack of confidence in RETs and low returns on investment (for financiers) and the non-availability of loans (for end users).

Potential Sector for Possible SREP Financing

Since only 1% of the rural population has access to electricity, and that most rural households depend on wood fuel, the household sector (especially in the rural areas) is recommended for possible SREP financing. Solar and micro -hydro are the recommended technologies.

As already mentioned above, Malawi is well endowed with good sunshine throughout the year for photo-voltaic (PV) and photo-thermal applications averaging 21.1MJ/m^2/day. Stand-alone solar PV systems could provide a lower cost solution to satisfy basic electrical service needs (such as lighting, radio and communications) in rural areas of Malawi than candles, kerosene and dry batteries currently being used in terms of cost per unit of light.

There are a number of perennial rivers with hydro power potential totalling 900 MW but the resource has been underutilized. These recommended technologies have been used in the country before and have proved to be workable. All that is required is to scale-up their uses.

Policy and Legal Framework

The Government of Malawi recognizes that renewable energy sources (RES) such as small hydro, wind, biomass, biogas, solar, geothermal and municipal waste have the potential to increase the power supply and diversification of electricity generation sources in Malawi besides income and employment generation. The National Energy Policy which was approved by Government in 2003 and operationalized by the Energy Regulation Act of 2004 and other Energy Laws, encourages the promotion and development of these indigenous renewable energy sources to enhance the country's electricity supply capacity.

Environment for private sector participation in renewable energy

According to the National Energy Policy of 2003, the Government of Malawi, through the Ministry of Energy, is committed to promoting electricity generation from renewable energy, and is encouraging potential Independent Power Producers (IPPs) to carry out feasibility studies on renewable energy generation on the basis of which power purchase agreements can be negotiated.

7.1.7 Sierra Leone

Overview of the Energy and Electricity Sector

Sierra Leone was already one of the world's poorest countries when a devastating 11-year civil war began in 1991. The war destroyed most of the very little infrastructure that existed in the country in the late 1980s. Since the end of that war in 2002, the country has made significant progress, but massive problems remain. Roads and power generation and distribution are inadequate, plus the country struggles with low professional capacity in government, poor public financial management and extreme sensitivity to global economic downturns. Emphasis to date has been placed upon restoring generation, transmission and distribution facilities destroyed during the war. The country has not yet been able to devote attention to expanding the national grid.

Poor access to electricity is recognized as a binding constraint to long-term economic growth in Sierra Leone. Fixing this problem is a major focus of the PRSP 2, called the Agenda for Prosperity, which included a goal of "cheap, affordable energy for all". The national electrification rate remained below 10% in 2011; the majority of the interior does not have access to electricity, and the country's four major cities consume 90% of the available electricity. Biomass from fuel wood

and charcoal still accounts for more than 85% of total energy use.

Before the war, Sierra Leone's installed generation capacity was about 120 MW. Nowadays, Sierra Leone has 90 MW of installed capacity, of which 86% is for Freetown. The hydroelectric facility at Bumbuna, completed in 2009, generates 62% of the country's power, and oil-powered facilities provide the remainder. Being seasonal, the Bumbuna hydropower plant produces less than 20 MW during the dry season. Currently, both the Bumbuna and Goma hydropower plants operate only at half capacity due to lack of maintenance and turbines needing a major overhaul. There is currently a high level of suppressed demand in the country. In fact, the mining sector primarily relies on captive generation to meet its large power needs. Non-mining customers are forced to resort to private standalone diesel generators. It is estimated that there are 33,000 generators currently in use that provide a capacity of approximately 180 MW.

Sierra Leone is currently experiencing a net deficit of power with average peak demand requirements of 300-500 MW and is in desperate need of new power sources. The country wishes to tap its great renewable energy (RE) resources to provide more reliable, secure and cheap electricity to boost its economy.

The estimated electricity consumption per capita is 30.50 kWh/year, while it reaches 88 kWh/year on average in the rest of the ECOWAS region, and about 535 Kwh/year in Sub-Saharan Africa. Grid power supply is restricted to Freetown, the capital, and a few major towns. Currently the country is not interconnected to the West African Power Pool, although the Guinea-Sierra Leone-Liberia-Ivory Coast interconnection project was approved in late 2013 and will link the four nations via a 225 kV transmission system by 2017. Supply in Freetown is insufficient and erratic whilst system losses are very high, principally as a result of the poor condition of the old and outdated distribution system.

Demand for electricity is increasing significantly, principally as a result of major mining developments but also due to the need to power economic growth. An estimated 10% - 20% annual rate increase in power demand is foreseen in the coming 10 years. With the large-scale development of mineral resources in Sierra Leone and mechanized agricultural activities, power demand will increase more rapidly.

Energy access for rural communities is critical in a country like Sierra Leone where about 60% of the population lives in rural areas (UN data, 2012). Renewable energy technologies will play a critical role in increasing energy access in remote rural areas where grid extension is not economically viable. Therefore, the Energy Directorate has started designing renewable energy programs to achieve this objective. The SREP program will present a good opportunity for strengthening such programs and co-financing them in selected areas.

Renewable Energy Potential and Experiences

There is great renewable energy potential in Sierra Leone, though very little has been harnessed so far. In terms of hydroelectricity, beyond the Bumbuna hydro plant, a 10 MW mini-hydro is being proposed in the Moyamba District for which funding is being sought. Mini-hydro for the Dodo dam in the Kenema District are also in operation. They are supplying electricity power to the East and Southern Provinces of Bo and Kenema during the rains with an existing installed capacity of 6 MW (that has the potential to be increased to 12 MW).[5] Two 2.0 MW hydro plants are also currently under construction, one at the Charlotte village in Rural Freetown, and the other in Port Loko, Northern Province. A biomass-to-electricity plant is operational in Makeni (Addax Project), which is expected to generate 15 MW at completion. The first 5MW supply from Addax is expected to be available to the national grid in June

2014, as the first phase has been completed.

In terms of solar energy, the Barefoot College - which has been supporting the scaling-up of solar PV solutions in rural areas in India since 1989 – has started operating in Sierra Leone in the format of training of trainers. The College program aims at enrolling up to 50 female students on four-month residential courses in solar engineering at the Barefoot College in Rajasthan, India. The Sierra Leone government has invested about US$ 820,000 in the project. The Barefoot College in India provided the solar equipment on which the college runs and the equipment for 10 villages; the Indian government sponsored the initial training as part of its south-south co-operation programme. This experience has great potential for scaling-up, especially in rural areas, which most need it.

An estimate done by the Economic Community Of West African States (ECOWAS) Centre for Renewable Energy and Energy Efficiency in 2013 shows that small-scale hydro might represent 60% of the total renewable energy potential of Sierra Leone, while biomass might represent 30% and solar energy 10%. The report further highlights that "some of the ECOWAS countries, such as Sierra Leone, have the potential to become electricity exporters through further development of their medium and small scale hydropower resources by 2025. This potential, which has not been fully analyzed yet, includes:

- Hydroelectricity: Up to 2000 MW capacity in total, with sites ranging from 2 MW to 160 MW.
- Biomass: Potential is high from forest resources, plus 656,400 tons of crop waste annually. Total generation potential is 2,706 GWh. Potential feedstocks include rice husks and straw. There is also potential in terms of sugar cane.
- Solar: Average horizontal irradiation of 4.1 – 5.2 kWh/m2/day. The current installed capacity of solar PV is about 25 kW.
- Wind: The potential has not been explored; measurement studies are needed and may indicate areas of wind speeds reaching 12m/s but with an average of 3-5m/s.

According to the Master Plan of Hydropower Development, Sierra Leone (exclusive of the two international boundary rivers of Mano and Kolenten) has a hydroelectric power potential of about 2,000 MW mainly concentrated in Northern Province and Eastern Province. However, nearly all suffer from enormous flow variations between the wet and dry seasons. The Master Plan, however, is silent on potential resources under 2 MW. This is expected to be an area of huge potential for public-private partnerships and wider investment by the private sector. It should be noted that a project linking Guinea, Sierra Leone, Liberia, and Cote d'Ivoire via a 225kV transmission line will form the backbone of Sierra Leone's national grid. The line is going through sites that have been identified as having hydropower generation potential.

Renewable Energy Policy and Targets

The 2009 Energy Policy's objective is to "ensure the provision of modern energy services for increased productivity, wealth creation and improved quality of life for all Sierra Leoneans." There are no specific renewable energy targets in the Policy, but it contains a chapter on renewables.

In 2014, GOSL started preparing a new Renewable Energy Policy, which should be approved by the end of the year. This new policy will contain clear targets for the development of the sub-sector, and will be backed-up by a master plan that is also under preparation.

Rationale for the Solicitation of SREP Funds

A series of barriers and bottlenecks have been identified for the deployment of renewable energy

in Sierra Leone; in terms of level of energy access, renewable energy resources and main barriers that need to be addressed in the sub-sector, the Government of Sierra Leone considers that SREP-funded interventions could complement other ongoing activities such as:

- Improving the enabling environment for scaling up renewable energy investments, through building capacity in the Ministry of Energy with RE dedicated staff; finalization of the RE policy; design of RE specific policy measures and regulatory incentives to attract the private sector; RE assessment for mini-hydro and biomass resources; pipeline of bankable feasibility studies for RE projects, etc.
- Design programs to meet the needs of rural areas, including mini-grids and off-grid options with mini-hydro, solar PV and biomass technologies according to the sites selected.
- Support the co-financing of one grid-connected independent power producer project, with RET to be confirmed during investment plan preparation.

Enabling Policy & Regulatory Framework

In the past decade, the country has made significant progress in terms of good governance. According to the Mo Ibrahim Index of African Governance, Sierra Leone improved in ranking from 48th (2011) to 30th (2012) out of 52 countries. Sierra Leone's formal business sector is relatively small and gradually evolving, but the country is rated as one of the world's top ten business reformers, moving from 176/185 countries, to 140/185 within a five-year period. The country has witnessed significant private sector inflows as foreign direct investment (FDI) has increased three- fold during the past five years. However, despite these gains, the most binding constraints for Sierra Leone's growth are linked to the critical infrastructure gaps in energy and roads transport, which if not addressed adequately, will severely limit private sector growth.

So far, the 2009 Energy Policy and the National Electricity Act 2011 guide the energy sector. The latter paves the way to the unbundling and restructuring of the existing public utility company and established two bodies: the Sierra Leone Electricity Generation and Transmission Company (the 'Company') and the Electricity Distribution and Supply Authority (the 'Authority'). The Company shall be responsible for the generation and transmission of electricity and the sale of electricity to the Authority, subject to a power purchase agreement. The Company will develop, construct and operate new government owned generating facilities or act as the Government's partner in a public and private partnership for the development of new generation projects. The Company will also develop, construct, own and operate future national transmission lines.

7.1.8 Lesotho

Overview of the Energy and Electricity Sector

The Kingdom of Lesotho, a land-locked country occupying 30,588 square kilometres is situated in Southern Africa and completely surrounded by South Africa (Figure 1). 74% of the country is covered by mountains and foothills resulting in most economic activities being limited to the remaining low lands and the Senqu river valley. The mountainous regions are predominantly used for grazing, mining and water resource development.

83% of the households in Lesotho are in rural areas and 70% households derive all or part of their

livelihoods from agriculture. The Human Development Index (HDI) value of Lesotho is 0.450 positioning the country at 160 out of 187 countries. A major impediment to human development in Lesotho is poverty; resulting from limited resources, low productivity etc. Unemployment for women is 33.1% and for youth is 37.6% and poverty level is high at 56.6%. The country is dependent on remittances from migrant workers from South Africa, regional customs union earnings and on development cooperation resources.

The total primary energy supply for Lesotho is 37.2 PJ and the country's energy mix is dominated by traditional biomass with a share of 66%. Modern forms of energy such as petroleum products, coal, electricity and LPG constitute the remaining 34%. Demand for Petroleum products is on the rise and increased from 163.7 million litres in 2006 to 217.6 million litres in 2010. Electricity only contributes 6% of the national energy mix and local electricity generation was 522.3 GWh from an installed capacity of 76 MW from hydro. The peak demand of 145 MW in winter is met through energy imports from the South African Power Pool (SAPP).

Industry is the biggest electricity consumer at 39% followed by domestic sector (households) at 34%. The annual per capita electricity consumption is 253 kWh, significantly below the African average of 579 kWh and the world average of 2,777 kWh. The household electrification rate is 30% with 65% of the urban households and only 6% of the rural households having access. It is estimated that in the year 2000, only 5% of the population had access to electricity but the number of households with electricity access has risen to 30% by 2013. The country has set electricity access targets to reach 35% of the population by 2015 and 40% by 2020. To meet the set targets, it is expected that these will be through renewable energy sources as these are the only sources the country has. It is also worth mentioning that the country electricity demand is largely from the renewable source (hydro) except for imports from South Africa. However the complex mountainous terrain of the country and small size of the remote settlements are likely to make large scale rural electrification through grid extension costly and unviable.

Therefore Lesotho energy planners may have to consider other alternatives such as mini-grids and solar home systems (pre-wired). Another rural energy challenge that the country faces is the availability of safe and modern cooking energy technologies. The rural population in Lesotho primarily rely on firewood, shrubs, animal dung-cakes, crop residues and paraffin (kerosene) for their cooking and space heating needs. The cooking and space heating is often done using inefficient and traditional stoves and the penetration of biogas systems and LPG is low. It is estimated that more than 1.8 million tonnes of woody biomass, shrubs, dung cakes and about 100,000 tonnes of crop residues were used as energy sources in 2009.

The current approach to provision of energy services to the rural poor is the provision of pre-wired solar systems for lighting and cell phone charging and provision of energy efficient cooking stoves.

Rationale for the Solicitation of SREP Funds

Lesotho has good renewable energy resources; the hydro power potential in the country is estimated at 14,000 MW spread over 22 sites. Lesotho also has good solar energy resources with over 300 sunny days in a year with annual average insulation levels of 5.25 – 5.53 kWh/m2/year. The country also has good wind energy resources with measured annual average wind speeds of 3.7 to 4.7 m/s at 10 m heights. Renewable energy sources have the potential to play an increased role in the country's energy mix, especially increasing the energy access rate and

displacing imported fuels.

As mentioned earlier in the previous sections, Lesotho is the net importer of electricity even though there is potential for generation especially from hydro and solar. The National Strategic Development Plan has identified hydro power development as key focus area for electricity generation for both local consumption and export. It is in this light that we think support for SREP will go a long way in assisting the country in becoming self-sufficient in electricity generation particularly from renewable.

Currently the main role players in the distribution of electricity are the Lesotho Electricity Company and Rural Electrification Unit. It is envisaged that an Independent Power Producer (IPP) would not only produce power for sale to the power utility but also distribute power produced to the surrounding communities in areas where extending grid would not be feasible (establishment of isolated mini- grids).

The major barrier to deployment of renewable energy technologies in Lesotho in the household sector has always been lack of financing mechanisms due to high upfront cost of the service to make the technologies affordable to rural households who are among the lowest income earning group in the country. The following are among the other barriers mainly in the domestic sector hindering widespread deployment of renewable energies:

- Energy needs for cooking, space heating and sanitation are not met by the existing efforts and most of the households in Lesotho are not convinced that Renewable Energy Technology can offer a complete package to address their needs. Households therefore continue to use firewood, shrubs, dung cakes and crop residues for these energy needs;

- Most of the rural households in Lesotho are inaccessible by road. Renewable energy service providers are reluctant to render services in such places and when they do, cost are usually escalated to unaffordable levels;

- Arrangements for service and maintenance of Solar Home Systems (SHS) and other renewable energy systems are unclear or non-existent. A significant number of SHS are not in working condition with the key issues being the failure of the electronic component – the inverter and the failure of the lead acid battery;

It is therefore proposed that support be availed to the Government of Lesotho through SREP to:

- Establish an IPP generating electricity from renewable energy sources and pilot this to distribute generated electricity to communities in the rural areas (establishment of an isolated mini-grid)
- Distribute pre-wired PV systems for lighting and cell phone charging and energy saving cook stoves for cooking.

Enabling Policy & Regulatory Framework

The Government of Lesotho has a dedicated Division specifically for the promotion and wide utilization of renewable energies within Department of Energy. This division has been in existence since the establishment of the department in 1985. A number of programmes have

been implemented supported by different cooperation partners. These include Advisory Project for Households And Energy Issues (APHABEI) with support from the German Government in the nineties, Lesotho Renewable Energy Based Rural Electrification 2006-2012 co- financed by the Government of Lesotho and UNDP to mention but a few. The energy policies have always been supportive to the development and wider usage of renewable energies. The Government intends reviewing the energy policy with the assistance of the European Union starting from 2014. It is worth mentioning that renewable will be given a special attention during this exercise.

The Lesotho Electricity Authority Act of 2002 resulted in the established of the Lesotho Electricity Authority (LEA) to regulate the electricity sub-sector. The law now allows many players in the electricity sector. It is possible to have Independent Power Producers (IPPs), specifically producing electricity for sale to the national utility and it is also equally possible to have an entity producing power and distributing it to the communities for different purposes. This has not been done and it would be interesting if the Government could get support from SREP to pilot this model in support of Government initiatives to increase access to electricity from the current 30%. The experience obtained from this could be replicated in other areas to increase access to electricity without having to invest heavily in national grid extension considering the terrain of the country.

There is also a good number of experienced solar system installers in the country that will be important in procuring good quality pre-wired systems for distribution to the households. To further reduce the prize of these systems, there will be a need to investigate the opportunities of establishing a warehouse in the country to have direct links with manufactures with good quality products. This will ensure that products allowed in the project have reasonable warranties in terms of performance and supply.

The procurement of services is open for competition and that services are advertised in local and international media. Lesotho has one of the most transparent procurement guidelines which are very open. The process leading to the selection of the best bidder is very transparent starting from the advertisement right through to the final selection of the winner.

7.1.9 Zambia

Overview of the Energy and Electricity sector

The country's Total Primary Energy Supply (TPES) is dominated by biomass with a share exceeding 70%, followed by hydro energy where 99% of all the electricity generated is derived. Petroleum accounts for about 9%, coal 2% and renewables 1% of the TPES.

In terms of renewable energy, the country is endowed with the following resources: solar; small hydro; biomass; geothermal and wind.

The resource potential for deployment of renewable energy resources is as follows:

Small Hydro

Zambia's hydro power potential is estimated at more than 6 000 MW with only 1 700 MW so far installed. About 29 small hydro sites have been identified mainly in Northern and Luapula Provinces, (4 MW) and North Western provinces (13 MW). A number of

feasibility studies have been undertaken in selected mini-hydro potential sites and the planned small hydro capacity (<30MW) up to 2019 is about 45MW.

Biomass

Zambia has a total biomass resource and economic bioenergy potential of 2.15 million tonnes, and 498MW, respectively. The largest contribution is from agriculture waste that registered 90% of total potential followed by forest waste with 9.3%.

Solar Energy

Zambia has an average solar insolation of 5.5 kWh/m²/day, with approximately 3,000 sunshine hours annually, 6 – 8 sunshine hours/day, hence providing good potential for solar thermal and photovoltaic applications.

Geothermal

Historic surveys have identified over 80 hot and mineralised springs across the Country.

Wind Energy

Wind speeds in Zambia average 3m/s at 10m above the ground, a speed which is mainly suitable for mechanical applications such as water pumping, but not adequate for power generation. However, there are indications that higher winds speeds sufficient for power generation may exist at higher heights, e.g. 30m – 100m and this needs to be explored further.

Current Status of the Energy Sector

Zambia is currently experiencing an electricity supply deficit of about 250MW at peak and has a low national electrification rate of about 23% with 48% urban and 3% rural however, the country is aiming to reach 90% and 51% access for urban and rural areas respectively by 2030. It is envisaged that these targets will be achieved through implementation of the Rural Electrification Master Plan (REMP) by the Rural Electrification Authority (REA) and the Increased Access to Electricity Services (IAES) project being implemented by ZESCO limited, the national electricity utility company.

The key national policy principles for renewable energy for Zambia are contained in the National Energy Policy of 2008 (NEP2008), the Sixth National Development Plan (SNDP, 2011 - 2016) and the VISION 2030. These documents form the basis for Government policy and subsequently determine the legal, regulatory and institutional frameworks for the renewable energy subsector.

The Vision 2030 document aims to transform Zambia from a low income country to a prosperous middle income country by the year 2030. With regard to the Energy Sector, the vision is to have universal access to clean, reliable and affordable energy by 2030 i.e. achieve 51% rural energy access and 90% urban access, while taking due regard of environmental protection.

Rationale for Selected Areas for SREP Support

There are a number of issues and barriers, both technical and non-technical, which impede the

large scale implementation of renewable energy technologies in Zambia;

- Lack of appropriate policy and regulatory support mechanisms;
- Lack of Institutional capacity for (micro) finance;
- Lack of dedicated training and research institutions for renewable energy leading to Inadequate design and installation skills, limited capacity to provide effective maintenance and after sales service and poor local technical infrastructure development;
- Lack of awareness and community involvement, particularly of women. Although renewable energy technologies are now increasingly technically mature and proven, there is still an awareness problem making them seen as expensive, complicated or risky. Community involvement is often critical to the success of local RE projects in order to match the project with the people's needs and wishes. Women play a vital role in this as they tend to benefit the most from RE projects.
- Lack of attractive climate for private sector participation in the renewable energy sub-sector. This situation is largely attributed to the absence of a renewable energy feed-in tariff policy mechanism as well as the current none cost-reflective tariffs.
- Historical reasons: Zambia has enjoyed surplus electricity capacity since 1970's. This means that there was no urgent need for new capacity including renewable energy. However, the current power deficit and need for rural electrification is changing the picture.

The technologies proposed to be considered for SREP interventions are listed below. It is worth noting that these subsector and associated technologies are listed in order of priority for possible SREP financing taking into consideration the availability of the resource in the country as well as the availability of information about the resource.

- *Small Hydro:* Small hydro Power Plants
- *Solar Energy:* Solar Mini Grids, Solar Water Heaters, Solar PV home systems *Biomass:* Biomass gasification Plants, Biogas Digesters, Biofuel production Geothermal Energy: Geothermal power plants
- *Wind Energy:* Installation of Windmills/Turbines

Enabling Policy & Regulatory Framework

The country's Poverty Reduction Strategy Paper (PRSP) acknowledges the importance of harnessing renewable energy resources mainly hydropower to meet the country's energy needs, however it does not stipulate the strategy for doing so. The Sixth National Development Plan (SNDP) has indicated targets of 1,000 MW above 2010 capacity level and improving electricity access to 15% and 40% in rural and urban areas respectively by 2016. So far, the access rates have increased from 3% in 2008 to 5% for rural and 21% to 23% for urban the progress in this regard has been made, though it is most likely that the targets won't be met due to a number of challenges which includes limited financial resources. However the government remains committed to realising the overall goals of accelerating the rate of increase access to electricity. In addition the SNDP also provides for the introduction of cost- reflective electricity tariff regime, establishing an open and

non-discriminatory transmission access regime in the electricity sector, and introducing an appropriate cost-effective renewable energy feed-in tariff (REFIT). So far a Grid Code has been launched to provide guidelines on the use of the national grid, and a process of the development of a Feed in tariff has commenced.

The National Energy Policy (NEP) sets out the Government's intentions aimed at ensuring that the energy sector's potential to drive economic growth and reduce poverty are harnessed. Specifically, on renewable energy the objective of the National Energy Policy is to address barriers to the wider deployment of Renewable Energy Technologies.

In 2010, the Zambian government through the Ministry of Mines, Energy and Water Development (MMEWD) developed the draft National Renewable Energy Strategy**.** This was in an effort to translate the objectives of the NEP into a practical implementation plan. The key objectives of this strategy keeping in line with the goals of the NEP, the Sixth National Development Plan (SNDP 2011-2016) and the Vision 2030 are:

- Access to modern energy services for all
- Meeting growing energy demand in a sustainable way

The draft RE strategy includes long term RE targets for specific applications. In terms of electricity, the targets are to generate 100 MW from solar, 200 MW from small hydro and 100 MW from biomass by 2030. In addition it is envisaged to disseminate 500,000 solar home systems and install 350,000 solar water heaters in order to reduce the demand load by 40 MW.

The government has also developed the Rural Electrification Master Plan (REMP) with the support of JICA through an extensive consultative process. The REMP is the blueprint for rural electrification for the period 2008 – 2030 and is to be implemented by the Rural Electrification Authority (REA). Electrification is being undertaken using three main methods: (is) extension of the national grid; (ii) construction of mini-hydro power stations where the potential exists; and (ii) installation of solar home systems. The full implementation of the REMP would increase the rural electrification rate of 3% in 2008 to 51% by 2030.

The government has established a number of institutions to focus on attracting the private investment in the energy sector. In order to attract investments, the Zambia Development Agency (ZDA) was established in 2006 by an Act of Parliament in the frame of private sector support programmes to make the country more conducive to the operations of businesses. In line with the economic reforms, ZDA is encouraging private investment in all priority productive sectors including agriculture, mining, manufacturing, tourism and energy. In that regard, the development of power plants to generate electricity from various energy resources including renewables qualify for tax exemptions under the ZDA Act's priority sector incentives. Further, there are specific incentives targeting all investments in the electricity sector.

7.1.10 Niger

Background

Niger is a large, landlocked country in the arid Sahel-Saharan region with a population of about 17 million people, the majority of whom are engaged in semi-subsistence agriculture. The country's total land area is 1.27 million square kilometres, out of which 2/3 is desert. More than 84 percent of the population is concentrated in rural areas in the areas around River Niger in the

south western corner of the country and along its long southern border with Nigeria. The central and north eastern regions are arid and sparsely populated, with the exception of a few smaller cities along the northern route to Algeria. Though droughts are frequent, about 80 percent of the population derives its livelihood from agriculture and livestock. Uranium mining and, more recently, oil production play an increasingly important role in the Niger economy.

Poverty incidence is declining, but Niger remains among the poorest countries in Africa with $650 GNI (PPP) in 2012, well below the average GNI in constant prices of $1,387 for low income countries. In 2010 the poverty headcount rate ($2.5 a day (PPP)) stood at 85.0% of the population, down from94.8% in 1990.Growth hit 11.1 percent in 2012 and is expected to average 7% for the 2012-2015 period, with natural resources playing a key role in GDP growth. International Aide finances about 40% of Niger's budget while much of the Government's revenues comes from trade (especially uranium and oil), investment (especially in the mining and hydrocarbon sectors), and remittances.

Niger currently has an unprecedented opportunity to accelerate economic development, reduce poverty and boost shared prosperity. Since 2000 only modest progress has been observed in social and economic indicators, due in large part to recurrent droughts, regional conflict and political instability. The successful political stabilization in April 2011, however, provided the basis for a stronger policy focus on broad-based growth and poverty reduction as well as for the strengthening of political institutions. The start of oil production in November 2011 and large-scale investments in the uranium sector promise to boost growth over the medium term while providing critical resources for the Government's development agenda. Taking advantage of these opportunities will require to mobilize greater private-sector participation in the provision of infrastructure as well as continued engagement by Niger's development partners in order to ensure adequate financing and technical support to reinforce good governance and build institutional capacity.

Niger's macroeconomic policy framework is considered to provide an adequate basis for the purpose of the proposed pilot activities under SREP. Average GDP growth is projected to remain above 6 percent over the medium term, with much higher rates anticipated during years in which extractive-industry projects come on-stream. External debt is projected to remain sustainable as electricity and other infrastructure bottlenecks are removed, boosting growth and exports. The main risks to the framework are commodity-price shocks, a deterioration in the security situation and institutional/governance challenges. As for the security situation, the Government has increased security expenditures by 1.25 percentage points of GDP in 2013 and continued to strengthen its cooperation with regional and international partners in an effort to address these complex challenges. Niger has thus demonstrated its ability to respond to the circumstances as needed in order to meet its economic targets, while at the same time pursuing an ambitious reform agenda.

Overview of the Energy and Electricity Sector

The energy situation in Niger is typical for the least advanced countries. The national energy needs are mainly covered by traditional energy resources (firewood, agricultural biomass, etc.). According to the Energy Balance of 2010, biomass represents 80% of the final energy consumption which is by far the main energy source for households and artisanal industries. As for electricity (thermal, coal), it only accounts for 3% of total energy consumed, even though Niger is well-endowed with domestic energy sources. Hydrocarbons (17%) and renewable energy

(0.01%) complement the energy balance. In 2010, Niger's diesel generation plants and the coal generation plant of Tchirozérine (SONICHAR) accounted for 13.5% of the total electricity supplied in Niger, while the electricity imported from Nigeria represented 86.5% of the total electricity supplied in the country. These, imports of cheap electricity from Nigeria have constituted Niger's main source of electricity supply since the early 70s. The share of these imports in the total electricity supplied has however declined recently, as the Nigeria electricity market has undergone significant market reforms. This decline in the relative share of electricity supply is expected to continue as the demand for electricity increases in Niger, and tariffs of imported electricity are expected to increase when tariffs are renegotiated in about one year time. Faced with this crisis, the Government contracted additional generation capacities in 2012 (30 MW of leased diesel generation plant Aggreko), and is currently building a new diesel plant of 80MW). An additional solar generation plant of 20 MW has been planned to complement the new diesel plant.

At the same time, Niger encounters high energy poverty. There is a strong electricity consumption growth during the last decade, and by 2013, the *"Société Nigérienne d'Électricité" (NIGELEC)*, the state-owned vertical integrated utility, had 250,980 customers in 401 communities. However, the energy consumption in the country is still very low. With an energy consumption of 0.14 tep per capita in 2006, Niger is far below the African average of 0.5 tep per capita. In addition, only 10% of Niger's population has access to electricity services, with large disparities between urban (40%) and rural (< 1%) areas which indicates that access to modern energy services is very limited, especially in rural areas

Renewable Energy Opportunities

Responding to these challenges is a major undertaking. Therefore, with more than 40 years' renewable energy experience, Niger is increasingly looking at solar and wind energy, as a potential source. The country is very well endowed with solar energy (5-7 kWh/d/m^2) throughout the year (about 3,200 hours/year).However, very little of this potential has been tapped. The overall installed capacity amounts to 4,042kWp (2% of the total installed capacity in the country) in 2013 – compared to 1,077 kWp in 2006with 31.51% for the telecoms and 52.50% for water pumping.

Countrywide wind data indicate an average wind speed of between 2.5m/s-6m/s. Indications from IRENA's Study on Assessing Renewable Energy activities (Évaluation de l'Etat de Préparation aux energies renouvelables) are that Niger's wind potential shows good prospects in the northern part of the country (regions of Agadez and Tahoua). Currently, about 30 small-scale installations are used for water pumping purposes. Wind installations have been the first renewable energy systems installed in Niger – mainly by missionaries since 1956. Besides solar and wind energy, the potential for energy from biomass is substantial in Niger. Current statistics indicate that approximately 5 million hectares of covered surface with forests are being exploited, with unfortunately only some parts of forests being renewable. Niger's hydroelectric potential can be found at the river Niger and its influent streams with three potential sites.

In order to gradually exploit renewable energy, RE programs have been considered in the major reference documents for the development of the country in general and of the Energy Sector in particular . This commitment confirms the Government's vision towards a high level of sustained economic growth with a low carbon economy and a greater access to electricity services of the population by developing and implementing the necessary policies. The statement for energy policy adopted in 2004 has been followed by many strategies and action plans for the promotion

of RE and the expansion of access to electricity services. This is notably the case of Niger's current *Plan for Economic and Social Development (PDES) which* was approved in 2012 and aims to bring about sustainable, broad-based income and welfare improvements.

The preoccupation for extending access to a larger share of the population is also put into evidence through the creation in 2013 of a National Agency for the Promotion of Rural Electrification (ANPER), although this entity is not yet operational. More specifically, in the National strategy and actions plan on Renewable Energies, the Government aims at the increased contribution of RE to the national energy balance from less than 0.1% in 2003 to 10% by 2020. The Government is also committed to translate its vision of the important role that Renewable Energy are called to play in Niger also in the legal and regulatory framework that is currently under revision to improve and update the Law for the Electricity Sector, Niger's commitment to Solar Energy has gone beyond the realm of policies. During the 1965-1980 period, Niger was a pioneer in the field of renewable energy much of the accumulated expertise under the direction of Professor Abdou Moumouni Dioffo, heading from 1965-1983 the National Office of Solar Energy (ONERSOL) which is an Institute focused on solar energy research to promote the use of this indigenous energy resource in Niger.

Rationale for Selected Sectors for SREP Financing

Despite this strong commitment from the Government to RE, the deployment of renewable energy in Niger at a large scale faces economic and financing difficulties, knowledge and capacity constraints, and also institutional, regulatory, and legal challenges. The Government views the private sector as an important partner for developing the energy sector and in particular renewable energy. However, project developers encounter multiple risks in developing renewable energy projects in Niger. These risks are due to a large extent to the absence of a legislative and regulatory text of RE, weak capacity and inefficiency of institutional structures, a lack of information and uncertainty about grid extension plans, currency risks (if PPA in FCFA), high investment costs of RE, resource and revenue uncertainty, lack of local expertise (needs assessment, installation, maintenance equipment), and resistance of consumers to change.

In order to address the wide areas of issues in parallel, questions about priorities, implementation capacity and expertise required need to be raised and answered. In such a challenging environment, prioritization is essential. The Scaling-Up Renewable Energy Program (SREP) can contribute to that and provide a systemic, standardized and coordinated approach for a long-term promotion and implementation of RE activities in Niger. The interventions under SREP will build on the experience from previous efforts. One such effort launched by Niger's authorities covered the development of an investment program for the period 2013-2022 to expand supply options by promoting the use of domestic resources, facilitate electricity trade, and extend the grid to expand access. However this investment program will need further assessment.

Another effort was the Government's process of the *Rapid Readiness Assessment* of how to deploy RE that was launched in June 2012 with support from IRENA. Identified actions included the development of a national RE policy, establishment of a regulatory and institutional framework favorable to RE, evaluation of solar and wind potential as well as actors capacity building. SREP will hence help to transform Niger's energy sector, from one that is increasingly fossil-fuel dependent to one that uses a more balanced supply of diverse clean energy sources. Achieving this goal will help the country to move along a low-carbon development pathway, increase energy security, generate new economic opportunities, widen access to energy services and engage the private sector. Finally, as mentioned earlier in the text, the

Government has undertaken a revision of the Law for the Electricity Sector that covers also aspects related to the use of renewable sources of energy, participation of the private sector and other laws and regulations needed to provide a clear and predictable legal framework for the sector.

In view of the large RE potential that exists in our country, and the priorities of the Government for rapidly expanding access for the population to basic services, as well as exploiting this RE potential, the Government sees the SREP for Niger as a tool to effecting a systemic change in the energy matrix of the country with a larger share of cleaner sources of energy, reducing the cost of electricity from using domestic resources, and expanding access to rural and disperse population. To this end the Government has identified solar energy, and to a lesser extent wind resources, as the types of renewable energies where it wants to focus the action of the SREP Program.

The large potential in solar resources allows to envisage a SREP Program that will support scaling up the use of this resources both for grid and off grid situations, and in rural as well as urban areas of the country. Based on the RE resource potential and the development energy needs of the country, SREP will focus on deploying solar and wind energy in grid- and off-grid areas of the country with three main components.

(1) In the grid connected areas, SREP will support the Government strategy to exploit the huge solar energy potential by developing a 20 MW Solar Generation plant that would be connected to the grid. The SREP supported plant would help transform the energy sector of Niger by directly reducing the country's dependency on electricity imports and equally important, by showcasing a pioneering way to a to a cleaner, reliable and economically sustainable energy future. This pioneering project will attract interest from private/development partners for the further scaling-up of solar resources in Niger, and the learning collected through the implementation of this first, major transaction could help in the formulation of such a scale up strategy. In addition to fostering a cleaner mix of energy (as it will displace mostly diesel), such project will make a significant contribution to lower the cost of electricity (if supported with SREP). SREP's support will complement AFD technical assistance, which aims to finance the feasibility study for the project, in a coordinated effort to bring solar in to the energy matrix of Niger.

(2) In the off-grid areas, SREP will support a program of electrification of village based on an integral approach to the social and economic development of the benefitted communities.
   a. *The Program will aim to maximize the contribution of solar solutions to expand access to electricity for households, community uses* (health and education centers, water pumping and public lighting), *and productive uses of electricity*, which include commercial and industrial activities in the communities, but also the use of solar pumps for irrigation.
   b. *Specific design and choice of technical solutions will vary based on the needs of the communities and the socio-economic levels of the population*. For instance, solar home systems could be used where families can afford them, while an option of Solar Battery Charging Kiosks could be adopted for areas with a greater incidence of poverty.
   c. *The design will also include the hybridization of isolated mini-grids* that are

working presently on diesel but that stand often idle due to the high cost or unavailability of carburant. The objective will be to install solar PVs, or if there is the potential wind turbines that will reduce the cost of the electricity and extend the period of service with the goal of reaching 24/7 at a cheaper cost for the users. NIGELEC has presently 76 diesel gensets throughout the national territory, but of which only 6 provide continuous services. The other 70 are used between 6 and 13 hours per day. Hybridization of the supply in these mini-grids would expand the duration and reduce the cost of providing the services to the communities in these areas. If successful, this model could be replicated when building future new mini-grids in underserved areas. Innovative business models could be explored that will offer the opportunity to the private sector to participate in the scaling up of hybrid mini grids, thus leveraging scarce public funds. In addition for the case of areas with wind potential, hybridization could be done with wind mills, but it will be necessary first to undertake one year of measurement to confirm the availability and reliability of the wind.

(3) SREP's program would further include technical assistance to the Government, NIGELEC and other relevant stakeholders to strengthen the institutional capacity and improve the business climate for the promotion and sustainability of renewable energies, and the active participation of the private sector. This support could focus on the consolidation or upgrading of the legal and regulatory framework, and the analysis of possible risk mitigation mechanisms that would foster the adoption of renewable resources both in grid connected and off grid connected areas.

The proposed program for the SREP presents Niger with an unique opportunity to effect a systemic change in its energy mix matrix, which can contribute to the reduction of poverty, very high in rural areas, but also considerable in urban areas since Niger as a whole is among the poorest countries in Africa. By targeting the rural areas, the proposed program will have a positive effect on a large share of the population and on the economic activity in these rural areas. On the other hand, by benefiting the urban areas, it will achieve a strong economic impact as Niger is starting to diversify its economy and developing more commercial and industrial activities, in addition to the mining and rural sectors. Finally, the proposed program will contribute to displace mostly diesel resources which today constitute the major sources of electricity in the country both for the grid connected areas as well as those isolated mini-grids, located in more remote areas.

Biomass in the form of wood and wood charcoal is also a major traditional source of energy widely used in Niger, but several donors are already providing significant support (WB, AFD) to the Government strategy to rationalize the use of scarce wood resources, through the elaboration of regional master plans and a national strategy for domestic energies. For this reason, the Government has decided to focus the scope of the SREP mostly on Niger's solar resources, and whenever appropriate on wind resources sufficiently close to areas in need of electricity, since the wind corridors with most potential have been often found to be too far away into the desert.

Enabling Policy and Regulatory Framework

Currently, renewable energy is not subject to any legislative text of Niger. A law on renewable energy, however, is currently being formulated in order to account for domestic, regional and international changes and to reflect Niger's energy commitments in the context of ECOWAS, UEMOA, technological changes (for example on renewable energies), changes in energy prices and

financing constraints. The overarching objective of the *2010 Draft Energy Policy Letter* is to contribute to poverty reduction through providing sustainable access to modern energy services by the various socio-economic groups. Its main pillars focus on energy security, energy access, environment protection and capacity development. In particular, it is envisaged to ensure energy access to all at reasonable prices, allowing energy services companies to maintain and develop the provision of energy services, and contribute to the country social cohesion. The draft policy proposes *six program areas*, of which three target (1) Household Energy, including the promotion of LPG, of the domestic mineral coal, improved cook stoves, and of biodigesters; (2) Rural Electrification, including off-grid decentralized generation (diesel, solar systems, etc.), strengthening, extending and densifying the electricity distributions networks, and also pre-electrification; and (3) Energy Efficiency, including improving energy efficiency in buildings, industry and transport, promoting energy efficient equipment, and related capacity building and awareness programs. Through this law, the Government can provide support in the form of loans, subsidies, fiscal advantages etc.in order to promote the increased utilization of RE.

7.1.11 Democratic Republic of Congo

Summary on the Country and the Energy Context

Since 1990, the economy has not experienced significant structural changes and extractive industries and agriculture are the main pillars of economic activity. Since July 2010, the DRC has irrevocable debt relief, in respect of the enhanced heavily indebted poor countries (HIPC) Initiative. Although the political and security context remains fragile in the DRC, the Economic Outlook in the medium term remains positive.

Despite the progress made, the DRC has a precarious social, contrasting situation marked by an important poverty that prevails over the whole of its territory with the huge natural potential of the country. The DRC will not be able to achieve the MDGs by 2015. In the index of human development (IDH) in 2012, the country ranks last (186th). Social problems are many: i) to health: unsanitary, important nutritional deficiency and difficult access to drinking water, ii) economic: low wages, conditions of access to labour and markets, iii) humanitarian: refugees and large displaced population, problems of access to public services and high rates of sexual violence.

The people's access to energy is very low. With regard to electricity, it is less than 1% in rural areas, 27% for urban areas and 9% nationally, or about 6,750,000 people have access to electricity.

Political Situation and International Cooperation

DRC is today at a crossroads of its history. Indeed, after a decade of instability and conflict which have claimed the lives of more than 3 million Congolese, progress of the last decade helped to regain a degree of political stability and reconnect with the international community for the implementation of a program for economic growth and poverty reduction that will accelerate through the resolution of the conflict in the East of the country.

The situation remains fragile when well even clues suggest that it is possible to continue with energy and determination, the efforts already initiated with support from the development partners in order to consolidate the success of the last years of standardization and ensuring sustainability - in order to achieve peace for the 75 million Congolese, but also for the whole of Central Africa.

Energy Sector

The Democratic Republic of Congo has abundant and diverse energy resources:

- Renewable (biomass, hydraulic, solar, wind, geothermal, biofuel, biogas...)
- Non-renewable (oil, natural gas, mineral coal, uranium, oil shale, tar sands,...)

Despite enormous hydropower potential estimated at 100,000 MW, the access of the population to electricity rate is 9%. This access rate is unevenly distributed between urban areas (8.5%) and rural (0.5%) as well as between the provinces. Wood energy still represents 93% of the domestic consumption of energy, usually in the form of charcoal in the cities and firewood in rural areas.

The population uses usually (more than 90% of households) wood fuels for its domestic needs for cooking meals and heating, causing deforestation and degradation of the forest with all the negative impacts on the environment, health, forest, biodiversity and socio-economic conditions.

One of the ways to achieve a sustainable energy development of our communities both urban and rural as the use of renewable energy sources available to the country in general and each rural areas in particular, to facilitate energy supply and thus help curb rural-urban migration.

Potential Resources for the Deployment of Renewable Energy

- **Hydro Resources**

Hydropower potential is important and is rated at 100,000 MW of which 44% are concentrated in the only site of Inga. Today, the total installed capacity is 2589 MW with an exploitation rate of the order of 50%. It should be noted that the generation, transmission and distribution accuses many difficulties (overload, obsolescence of certain equipment, vandalism, low efficiency, low purchasing power of consumers,...). Two hundred eighteen (218) hydroelectric sites have been identified across the country for the following power ranges:

a) Sites for from 10 kW to 500 kW
b) Sites for capacities lower than 1 MW
c) Sites for powers ranging from 1 to 9 MW
d) Sites for powers greater than or equal to 10 MW

- **Solar Resource**

The DRC, located in a high Sunshine Band which different values included between 3.500 and 6,750 Wh/m2/day, is therefore naturally favoured to exploit this form of energy that is currently underutilized.

- **Wind Resource**

There is in the Democratic Republic of the Congo a limited wind potential. Several completed or ongoing studies designed to determine the wind direction of the targeted sites. These studies indicated by low annual average wind speeds ranging from 2.5 m/s to 5.5 m/s.

- **Biomass Resource**

The country is highly dependent on wood fuel that currently meet the bulk of wondered energy (95%) 45 million m3 per year and is responsible for the annual destruction of 400000 hectares of natural forest. Wood energy is mainly used for cooking food in households. The use of biomass can be done without damage when it uses the wood to sustainable production (agroforestry, reforestation, natural regeneration assisted, etc.) and the use of technology for high efficiency of transformation (improved carbonization and cook stoves). Currently, DTL program, in collaboration

with access is in phase to stimulate the dissemination of the improved stoves in the basin of the city of Kinshasa with a commercial approach to supply.

- **Biogas Resource**

The population of Kinshasa, alone produces per day more than 6000 m^3 of solid waste containing at least 65% of the organic matter which half is only likely to be evacuated by a classic collective system.
These wastes can favour the construction of digesters with a capacity of 20 million m3 capable of producing not less than one billion m3 of biogas per year. Lake Kivu which stores 50 billion Nm3 of methane is an important potential source of gas for household use in wood energy substitution.

- **Biofuel Resource**

The potential in bio fuel in DR Congo is huge and varied. Depending on the technology used, it is possible to produce, among other things:

- Pure vegetable oil from seeds or fruits of crops such as rapeseed, palm oil, Jatropha Curcas, etc. to replace conventional fuels;
- Biodiesel, obtained from oils processed by a chemical process used without any damage to the motor;
- Bioethanol by the fermentation of sugar or starch;
- Second generation biofuel based on waste, residues, cellulose and Nonfood ligno-cellulosic material.

In this regard, it has been noted that the DRC has vast areas of unexploited savannas that could be used to produce these fuels.

The opportunities offered by biofuels in RD Congo include:

- Access to modern energy services, especially in rural areas;
- The decrease in the petroleum import bills;
- Increased productivity of agriculture and the income from the use of residues and waste in production processes;
- The growth of opportunities for jobs in associated industries;
- The reduction of polluting emissions, including greenhouse gas, etc.

- **Geothermal Ressource**

DRC has not yet evaluated geothermal potential. However, several geothermal sites have been identified in the East of the country especially in the Western branch of the African rift valley. The exploitation of this resource can be used in the production of heat or electricity from riparian communities.

In conclusion, the hydroelectric potential appears predominant in the majority of provinces. Solar energy can play an important role in several of them with the implementation of individual solar systems or the erection of photovoltaic solar power plants. Biomass is probably essential to the Province of Ecuador, but can also complement the two energies above mentioned in the other provinces.

Policies on Renewables and Implementation Measures

The DRC does not strictly speaking a specific policy on renewable energy. However over the past years the question was systematically addressed in the as sectoral national strategy documents listed below:

- Document of policy in the sector of electrical energy, Department of energy, May 2009.
- DSCRP DRC I and II, Ministry of planning, July 2006 and 2011.
- Document of Strategies for national rural electrification of the DRC, Ministry of Energy, May 2009.

In its vision and objectives of electricity and renewable energy sector, the Government of the DR Congo would improve populations access to electricity by reliable, non-polluting sources, by exploiting all available resources including; renewable energy (hydro power, solar, biomass, biogas, bio fuel, wind, geothermal, etc.), while focusing on hydroelectricity.

By the manifestation of this political will, the DRC can overcome the major challenges of this sector, the rehabilitation of electricity parks which are in the most part cases in judgment, the construction of new infrastructures and plants of electrical production, and the use of all forms of renewable energy.

The Government's strategic objective is to increase the rate of access for electricity of ± 9% to ± 60% by 2025 for its sustainable development and especially to fight against climate change.

The Government has also adopted in 2006, a Master Plan by 2015 which focuses on the need for electrical energy within the reach of all Congolese to vitality, particularly rural populations. The specific objectives of the Management Plan are to: i) reduce the imbalance of energy development between provinces; (ii) increase the rate of electrification at the national level from 121 electrified centres (urban and rural) 775 centres to electrify; (iii) to promote the electrification of rural centres through the use of new technologies for the power supply of the rural centres; (iv) retraining in hydroelectricity from the centers fed by thermal power stations; (v) promote exports.

In 2009, the electricity sector policy document proposes to respond to specific objectives including the promotion of all renewable energy sources other than hydropower, with notably the rational and sustainable use of wood fuels in substitution of diesel in the independent centres for thermal generation.

Purpose of the SREP financing

Identification of barriers to the deployment of renewable energies

Under the climate investment fund, it was set up the SREP financing to help countries develop renewable energy sector to contribute to the collective fight against climate change.

Potential sub-sectors eligible for possible SREP financing are:
Hydraulic energy, solar energy, wind power, biomass, geothermal energy.

The technologies covered by these different subsectors are:

- For hydroelectricity: small hydropower
- For solar energy: solar photovoltaic and solar thermal
- For wind power: wind turbines
- For biomass:
    - o technology for biogas (digester)
    - o biofuel technology
    - o wood energy (improved stoves, improved carbonization, agroforestry, reforestation)

-For geothermal energy: thermal power plant

Rationale for their prioritization in the SREP interventions

This prioritization in the SREP interventions justified for:

- Hydro-electricity by:
  - The availability of the resource;
  - The lower cost of kWh;
  - Performance high compared to other technologies.

- Solar photovoltaic by:
  - Individual domestic solar kits;
  - Micro PV for collective equipment;
  - Application for isolated sites;
  - Energy, economic and environmental obvious (development of a local market, development of the industrial sectors with entrepreneurship, creation of jobs, direct and indirect contribution to energy saving,...).

- Wood energy by:
  - Sound management of the resource;
  - Energy cost is competitive and the price varies very little.
  - Energy which create jobs.

- Biofuel by:
  - Potential huge and varied;
  - Certain species such as Jatropha curcas enhances the Savannah and marginal ecosystems.

- Biogas by:
  - Environmental sanitation;
  - Production of organic fertilizers;
  - Recycling of waste, public health and hygiene;
  - Combating pollution and rural ecology.

Policy and Regulatory framework

The Document of Electricity Policy from 2009 that is actually being updated deals with:

- The reform of the legal, regulatory and institutional framework;
- Reform of the SNEL;
- The management of energy resources;
- Participation in the regional integration projects (interconnection).

The major constraint to solve the problem of development of production capacity and meet the needs of the populations on energy, remains indispensable way solving the funding equation. This will of course by a consolidation of the legislative and regulatory framework and the easing of investment codes to attract private capital.

It is among others;

- Liberalize the (current) energy sector;
- Conduct institutional reform (in progress also).

- Have the policy document of the energy sector electrical, valid in May 2009 and adopted at the level of the Government (ongoing process);
- Have a law of electricity that was adopted by the Parliament and pending its promulgation;
- Dispose of the renewable energy sector policy document;

Also have a code of renewable energy, in order to attract private investors and secure consumers, because it will define among others the tariff rules, standards and norms (initiative and ongoing attempt);

- To promote public-private or private-private partnerships and the transfer of technologies in the sector of renewable energies;
- Implement certain plans of actions or programmes to short, medium and long term to develop this sector.
- Facilitating the access of private sector funding for certain projects in the field of renewable energies, etc.
- Mobilize and involve all stakeholders (institutions, private partners, population, etc.) and encourage the formation of networks.

By the manifestation of this political will, the DR Congo can overcome these challenges in this sector, by the rehabilitation of electricity parks that are in most cases stop, by building new infrastructure and electric production plants, and by using all forms of renewable energy.

7.2 South and East Asia and the Pacific

7.2.1 Bangladesh

IDCOL

Infrastructure Development Company Limited (IDCOL) is a government owned development financial institution under the Economic Relations Division of the Ministry of Finance of Bangladesh. It was established on 14 May 1997 jointly by the Government of Bangladesh (GoB) and the World Bank and is licensed by Bangladesh Bank (the central bank) as a non-bank financial institution (NBFI) on 5 January 1998. The mission of IDCOL is to catalyse private sector participation in infrastructure, renewable energy, and energy efficient projects in a sustainable manner.

IDCOL extends long-term concessionary financing and grant as well as capacity development supports to NGOs, micro-finance institutions and private entities in renewable energy. It also provides long-term financing in both local and foreign currencies for the development of infrastructure projects by the private sector. Besides, IDCOL provides corporate and financial advisory supports in the national and international level in project finance, financial modelling, off-grid rural electrification, etc.

IDCOL sources the required fund for financing from the GoB and multiple development partners i.e. the World Bank, Asian Development Bank (ADB), Islamic Development Bank (IDB), Department for International Development (DFID), Japan International Cooperation Agency (JICA),German International Cooperation (GIZ), German Development Cooperation (KfW), Global Environment Facility (GEF), U.S. Agency for International Development (USAID), and Global Partnership On Output-based Aid (GPOBA).

As of June 2013, total assets, equity, paid-up capital, operating income, and net profit of IDCOL were

USD 477 million, USD 35.5 million, USD 22 million, USD 24 million and USD 13 million, respectively. With total loan disbursement portfolio of USD 651 million, IDCOL is the largest financier in private sector infrastructure and renewable energy projects in Bangladesh.

IDCOL is disseminating different types of renewable energy technologies primarily in the rural off-grid areas of the country. Its solar home system program is renowned worldwide as the fastest growing off-grid renewable energy program in the world. It is also implementing biogas program, improved cook-stoves program, solar mini-grid, solar irrigation pump, biogas and biomass based electricity projects etc.

IDCOL is currently in the need of additional USD 28 million grant and USD 211 million credit fund to achieve the target it has set up to 2017 under its renewable energy initiatives. Out of this IDCOL is looking forward to receiving grant support of USD 15 million from SREP under Climate Investment Fund.

Country and Energy Sector Context

Bangladesh has the world's eighth-largest population with more than 160 million people, making it one of the world's most densely populated countries. The country is divided into seven administrative divisions and 64 districts.

Bangladesh is identified as a Next Eleven economy. According to the United Nations in 2010, the country is making major strides in human development, including significant progress in the areas of gender equity, universal primary education, the empowerment of women, reducing population growth, food production, and health and renewable energy. The poverty rate has declined considerably since independence, and per-capita income has doubled from 1975 levels. However, the country continues to face a number of major challenges, including widespread poverty, overpopulation and vulnerability to global climate change. Per capita income of the country is one of the lowest in the world.

Bangladesh's energy infrastructure is relatively small. The per capita energy consumption in Bangladesh is one of the lowest in the world, which is 321 kWh. Non-commercial energy sources, such as wood fuel, animal waste, and crop residues, are estimated to account for more than 50% of the energy consumption. Bangladesh has small reserves of oil and coal, but very large natural gas resources.

Electricity is the major source of power for most of the country's economic activities. Only 62% of the population has access to electricity including 7% from renewable energy. Total installed electric generation capacity was 10289 MW in January, 2014. About 67% of generated power comes from natural gas and the rest is from liquid fuel, coal and hydropower. The present share of renewable energy is only 1.3%. Bangladesh has 130 MW solar energy capacity through rural households and 1.9 MW wind power.

Government of Bangladesh has taken a systematic approach towards renewable energy development. The initiative includes development of relevant policy and institutional development. As part of the new generation expansion initiative in line with growing demand, the Government has planned to enhance national power generation capacity to be 16000 MW by 2015. Expected generation from renewable sources should then be then at least 800 MW.

Rationale for Selected Sectors for SREP Financing

Bangladesh has enormous potentiality in renewable energy development like solar, biogas, and biomass.

Bangladesh receives an average daily solar radiation of 4-6.5 kWh/m2. Solar photovoltaic (PV) are gaining acceptance for providing electricity to households and small businesses in rural areas. Around 17 million households are located in off-grid areas. Of the off-grid population, a vast majority (89% or 15 million households) is concentrated in rural Bangladesh. This off-grid area is targeted for supplying solar home system (SHS). About 2.9 million SHSs have been installed till March 2014 under the program and total number of beneficiaries electrified is 13 million-which is around 8.2% of total population. IDCOL has a target to install 6 million SHSs within 2016 which would cover around 15% of total population.

About 84% of the population directly or indirectly still depends on agriculture. The cattle dung is still a principle source of fertilizer. Declining of soil fertility in Bangladesh is attributed mainly to over-exploitation of land without proper replenishment of plant nutrients in soils. Crop residues and animal dung are widely used as fuel rather than fertilizer.

On the other hand, agriculture residues and dung are commonly available in and around the household premises which can be used for biogas generation. Among the other potential alternative sources of rural energy, biogas generated from animal dung is undoubtedly one of the most appropriate sources of energy used for cooking in the rural communities. Besides, residues from the biogas plant is very good fertilizer. Widespread use of biogas for cooking purpose will help poverty reduction through savings on energy expenditure and increase agriculture production by utilisation of bio-slurry as high quality fertiliser. Other impacts include better health through cleaner cooking energy and improved sanitation with toilet construction and connection to bio-digester and gender equality through empowering women in decision making and maximization of their participation in the program. At present IDCOL finances biogas plants from 1.2 m3 to up to 4.8 m3 size.

According to the latest census of the bureau of statistics of Bangladesh, Bangladesh has more than 97,000 poultry farms, 47,000 dairy farms for cattle fattening, 20,000 goat-farms registered ship-firms 394. The livestock industry of Bangladesh produces about 419,789 ton wastes per day, polluting soil and water resources and creating environmental hazards. Besides, cow dung produced in many dairy firms can also be used for biogas based power generation. From this minimum 1,000 MW power can be produced. In addition, the slurry produced as a by-product, is a very good organic fertilizer and can be used for increasing agricultural productivity and maintaining soil stability.

IDCOL had so far financed 4 biogas based power plants with various capacities. The largest one with 140 cubic meter biogas plant can run a 50 kW generator for 6 hours daily. These plants are also selling biogas to the nearby households for cooking purposes.

Price hike of diesel has always been a major concern to the farmers of Bangladesh and the Government historically has been subsidizing diesel price to keep cultivation cost low. On the other hand, in grid areas frequent power shortage and low voltage disrupts the irrigation facility causing lower production of crops. Considering the energy crisis and increasing price of petroleum products, it is important to explore alternative energy sources for irrigation to ensure both food and energy security. Solar powered irrigation system is an innovative, economic and environmentally friendly solution for the agro-based economy of Bangladesh. Solar panels utilize daily sunshine to generate electricity, which in turn, runs the solar pump to provide uninterrupted irrigation water

supply to the farmers. The technology also has tremendous potential to reduce the demand for grid electricity.

In Bangladesh, solar irrigation pumps can supply water almost throughout the year due to availability of adequate sunlight. However, initial investment of Solar Irrigation Pumps is very high. Therefore, optimum utilization of the pump capacity has to be ensured. Solar irrigation pump remains idle for a significant portion of the year especially during rainy season. Therefore, IDCOL is exploring the possibility for alternative use of solar electricity in nearby areas.

Bangladesh has potential for biomass gasification based electricity. More common biomass resources available in the country are rice husk, crop residue, wood, jute stick, animal waste, municipal waste, sugarcane bagasse etc. Exploration of these resources for electricity generation is still at preliminary stage. Potentials for utilizing biogas technologies derived mainly from animal, kitchen and municipal wastes may be one of the promising renewable energy resources for Bangladesh.

Micro hydro and mini hydro have limited potential in Bangladesh with exception of Chittagong Hill Tracts. Hydropower assessments have identified some possible sites from 10 kW to 5 MW.
However, potential of other renewable resources is still at the exploration stage. Potential of wind energy is mainly in coastal areas and offshore islands and to determine extent of potential wind resource mapping project is in process. Some of the development partners and companies come forward for wind mapping in different parts of the country.

7.2.2 Kiribati

Energy Context

The energy profile for Tarawa and Kiritimati are both very different from the outer islands. Electrical and petroleum energy use are dominant in Tarawa and Kiritimati, while in the outer islands most energy is supplied by biomass and solar energy. Supply of electric power is provided primarily by the Public Utilities Board (PUB) on Tarawa, though there are small grids on Kiritimati and at some boarding schools and Island Council (IC) facilities on other outer islands. The on-grid access to electricity is 87% on Tarawa, 75% by the multiple small grids on Kiritimati and 54% on the Outer Islands. The access to electricity on the Outer Islands is mostly supplied from solar off-grid system and a few generators supplying IC offices, Secondary School and Community facilities.

The country has no conventional resources of energy. Providing energy for electricity and transportation to the dispersed islands is overwhelmingly dependent on imported fuel oil, and therefore vulnerable to fuel price volatility. Diesel fuel oil accounts for bulk of the energy supply in the country (about 60% in 2011). The key to energy security and reduced vulnerability is to diversify energy supply, and to include a balance between demand-side management, increases in the efficiency of existing energy supplies, and the development of new fuel and electricity sources that use cheaper fossil fuels or are renewable. The Government of Kiribati is very much aware and concerned about environmental degradation as a result of the heavy dependence on diesel fuel and global warming and is therefore actively focusing on the use of renewable energy capable of supplying reliable electricity to the islands.

Kiribati is resource poor in general but does have a good solar energy resource. However, thus far the share of solar in the energy balance accounts for no more than 1% of the total energy

consumption, as it has been used almost exclusively for outer island lighting and basic electrification with little grid-based generation. This is soon to change with large grid-connected solar installations planned with World Bank, United Arab Emirates and the Government of Japan (PEC Fund) and by the rural electrification project financed by the European Union. Biomass is by far the largest renewable energy use, with coconut husks, shells and fronds being the dominant energy source for cooking and copra drying in Kiribati due to its abundance. Biomass is estimated to supply about 25% of the gross national energy use. Other renewable energy sources, such as wind and biofuel, remain negligible sources, though there is substantial development potential for both based on the resource assessment that was carried out lately on wind and biofuel on the two main Islands of Tarawa and Kiritimati.

Policy and Regulatory Framework

The National Energy Policy was established in 2009 in association with the Kiribati Development Plan and has as its primary goals human resource development in the energy sector, development of livelihoods, energy security and energy access. The guiding principles are sustainability, gender equity, environmental compatibility, stakeholder participation, good governance and cultural/traditional compatibility.

With regards to renewable energy the policies include:

- Promoting sustainable renewable energy access;
- Ensuring that the limited biomass resources are used in an economically, environmentally and culturally sustainable manner;
- Strengthening collaboration with development partners for the advancement of renewable energy programmes;
- Promoting and encouraging the use of appropriate renewable energy technologies;
- Expediting the replication of successful solar programmes; and
- Introducing appropriate incentive packages including taxes, duties and tariffs to encourage the use of renewable energy technologies.

In 2012, the Government of Kiribati and the International Renewable Energy Agency (IRENA) conducted a Renewable Readiness Assessment (RRA) with a goal to maximize the economic use of Kiribati renewable energy resources. The results of the study are listed below;

- Maintaining grid stability while allowing a high level of solar PV input.
- Develop CNO as a biofuel for power generation and transportation.
- Rural electrification using renewable energy.
- Policy, legislation and regulation development to support renewable energy.

Another significant outcome of the RRA is the fossil fuel reduction target for electricity generation by 2025 which was stated in the Majuro Declaration. This is an important measure to reduce the consumption of imported fossil fuel and the Government is committed to work towards achieving the target with the support from its development partners.

Rationale for Selected Sectors for SREP Financing

Renewable development in Kiribati have been focused mainly on solar both in the rural and urban area while there has been moderate development on the use of CNO as an alternative fuel for use

in the Power and Transport sectors. The use of CNO as biofuel has potential in curbing the use of fossil fuel for transportation which presently consumes more than 50% of the annual fuel imports.

The Kiribati Copra Mill Company Limited has been refining coconut oil for mixing with diesel fuel and kerosene to make biofuel and its understands the possibilities of using its CNO production as biofuel. The refining process includes some reduction in fatty acid content and 5 micron filtering. In 2006 the plant boiler successfully used diesel fuel for start-up and the refined CNO for its operation. Tests of various blends of CNO and diesel fuel or kerosene have been carried out and it was found that above 20% CNO mixed with diesel fuel the boiler was hard to fire up but with kerosene trials up to 40% kerosene and 60% CNO was satisfactory. Tests also have been carried out on the plant backup generator and vehicles. Tests were stopped when engine problems occurred, mostly in the form of fuel filter clogs and carbon build up in the engine cylinders. These technical issues experienced in using CNO biofuels were much associated with a lack of information about the specifications required of the product and the type of equipment needed for its refining and quality control.

A South Pacific Applied Geoscience Commission (SOPAC) study published in 2006 estimated that the annual production of CNO in Kiribati could be sustained at 3-4 million litres per year and that level of production could be used for biofuel without impacting traditional uses, including pig feed and human consumption.

The proposed project for SREP financing will focus on CNO for Biofuel use in both the power and transport sector through a budget estimated at $4 million (Australian). There will be 4 components for this proposal and the proposed actions are as follows;

1) **Component 1: CNO implementation Plan**
    - Prepare a CNO implementation plan for Kiribati's CNO Biofuel development that shows the specific actions, timelines and resources necessary to develop CNO as an acceptable diesel fuel replacement for land and sea transport and for electricity generation.
2) **Component 2: Fuel standard and quality control**
    - Establish fuel standards and a testing facility for CNO based biofuel to be used for testing fuel intended for power generation and transport in Tarawa and Kiritimati Island.
3) **Component 3: Mobile Copra mills**
    - Develop mobile copra mills for use on Kritimati Island and Teraina that can be managed by local operators and themselves moved among production areas so as to avoid the high cost of transporting coconuts from plantations.
4) **Component 4: Electric power generators**
    - Procure an electric power generation (genset), designed for use with CNO for base load generation for Tarawa and for Kiritimati power generations.

7.2.3 Cambodia

Energy and Electricity Sector

About 45% of the country's population has access to electricity, one of the lowest in Southeast Asia. While urban areas enjoy 100% electrification, the rural population suffers from energy poverty with only 40% having access to the grid and about 50% having access to alternative off-grid electricity sources. In 2011, the per capita electricity consumption is 298 kWh per year.

Imported petroleum products are the main source of commercial energy for power generation, industry, transport, and the residential and commercial sectors. Fossil fuels are projected to become the largest energy source, and demand for petroleum products will be driven mainly by demand for diesel and gasoline, as the country becomes more motorized and passenger cars more common. Cambodia has an estimated 1.8 million registered vehicles, of which most are motorcycles, with only about 300,000 passenger cars. The passenger car motorization rate is about 20 per 1,000 people versus around 500 per 1,000 in the developed countries.

The total installed capacity is 635.5 megawatts (MW) and electricity supply of 2,674 gigawatt-hours (GWh) per year. From 2002 to 2011, the annual electricity demand growth averaged 16.3% at the national level and 17% in Phnom Penh. In the projections prepared by KEPCO of South Korea and EGAT of Thailand, Cambodia's power demand would reach 9 terawatt-hours (TWh) per year by 2020 - more than triple from 2011. These projections assume an 11% annual increase in demand which is well below the 16% annual increases over the past 10 years.

The national utility, Electricité du Cambodge (EDC) mainly supplies the capital city, Phnom Penh, while many rural areas are supplied by rural electricity enterprises (REEs). The bulk of generation output is from fossil fuels, particularly heavy fuel oil, resulting in high electricity prices. Although electricity imports from neighbouring countries have been on the rise, the supply of electricity still suffers shortage and reliability.

Threatened with high and rising oil prices and implications for the country's energy security, the government is exploring new sources of alternative energy. Renewable energy (RE) potential is high but resources remained untapped:

Hydropower: potential than 10,000 MW; only 684 MW has been developed, with many projects under construction.

Solar: high potential with average of 5 kWh/day and average sunshine duration of 6-9 hours per day.

Wind: potential is estimated at 3,665 GWh/year, but only a small percentage of it is being tapped. The southern part of the Tonle Sap lake, mountainous districts in the southwest, and coastal regions such as Sihanoukville, Kampot, Kep and Koh Kong have annual average wind speed of 5m/s or greater.

Biofuel: Jatropha plantations cover about 200 hectare (ha); palm oil about 4,000 ha with possible expansion to 10, 000 ha; and sugar cane with 20,000 ha.

Biomass: Generation potential was estimated to be 18,852 GWh per year (approximately 35 times EDC generation in 2002). Significant sources are rice husk, sugar cane bagasse, cassava stems, etc.

Biogas: Effectiveness of small scale biogas has been demonstrated by a number of different projects. The use of animal wastes to generate high quality gas for cooking has significant economic, health, social and environment benefits for poor households.

Rationale for Selected Sectors for SREP Financing

Electricity is expensive in Cambodia and prices are much higher in the countryside than in towns and cities. In 2011, Phnom Penh had the cheapest electricity for households, $0.15 per kWh, while in the most expensive concession area in the country (in the Seam Reap province) one kWh cost $1.00 during peak months. Overall, prices for households typically ranged from $0.30 to 0.80 per

kWh, but in the countryside prices vary between $0.65 and $0.90 per kWh. Several factors explain the higher prices in the countryside: most of Rural Electricity Enterprises (REEs) are using inefficient diesel generation, load factors are low as consumers cannot afford high tariffs resulting low consumption, supply losses are higher than optimum, and fuel transportation costs cost to rural areas increase the cost of supply. Furthermore, elevated costs of capital and financing and high risk premiums against rural customers' low capacity to pay their bills increase the end-user price.

The Government has set two key goals for rural electrification: (i) All villages have access to electricity of some type by 2020; (ii) At least 70% of all households have access to grid-quality electricity by 2030. At present, Cambodia's development of RE sources is very slow in comparison with its neighbouring countries. The status of RE Technologies (RET) is mainly in initial development and demonstration stages. Support is needed to overcome barriers as described below.

Potential Sector/Subsector for SREP Financing

The proposed SREP interventions will be anchored to the country's Rural Electrification Strategy which specifies best electricity supply option for rural areas. The most appropriate candidates for SREP support appear to be: (i) solar/hybrid mini-grids, stand- alone solar home systems (SHS), solar water pumping for irrigation and solar battery charging stations to replace existing diesel operated battery charging and (ii) micro-/mini- hydropower. Given current retail pricing, further private sector participation in solar development can be promoted while also striving to reduce retail energy prices.

Solar. Conversion or introduction of solar/hybrid mini grids could provide reliable, affordable, efficient, and environment-friendly energy service options. The program will also specifically look on the potential solar lighting and other solar home systems. In 2011, a project funded by World Bank installed 12,000 solar home systems (SHS) throughout seven of Cambodia's provinces from mid-2011 until January 2012 whereas the Rural Electrification Fund (REF) recently initiated another project for the installation of 4,000 SHS in year 2014. SREP funding will complement REF's efforts to promote equitable rural electrification coverage by facilitating the population's access to affordable electricity for economic, social and household uses. Conversion of existing diesel based systems into PV solar by entrepreneurs is already under study by ADB per request of the Ministry of Mines, and Energy (MME) to attract local investments in this sector and promote solar application in country. SREP funds would be used to scale up SHS and other applications, and support modern micro-/mini-grid development.

Mini/Micro Hydro Power. Potential for micro-hydro power (MHP) is around 17 MW, and overall hydro potential is estimated at 10,000 MW. The JICA-funded "Master Plan Study Rural Electrification by Renewable Energy" recommended the off-grid electrification with micro hydropower scheme for mountainous or hilly areas where hydropower potential is bigger than village size demand; a total of 145 potential sites with capacity range from 1 kW to 2,585 kW were identified in the study.

Biomass: New Energy and Industrial Technology Development Organization (NEDO) has conducted an assessment of the potential for using biomass as a source of renewable energy in Cambodia. The report has identified significant biomass energy resources from agricultural residues (e.g. rice husk, acacia, cassava luscenia, coconut, etc.) For rice husk, alone, around one million tonnes are being produced yearly; this is equivalent to 60-100 MW capacity.

7.3 Latin America and the Caribbean

7.3.1 Nicaragua

The Energy Context

Due to the development policies promoted by the GRUN over the past 7 years (2007-2013), GDP trends are now more positive; from 2011 to 2012, GDP grew 5.2% to reach $10,500 MUSD (WB). This economic growth, combined with an adequate legal framework and abundant and diverse natural resources, makes Nicaragua attractive to investors; net foreign direct investment (FDI) reached $810 MUSD in 2012.

The constant economic and social dynamisms of Nicaragua postulate significant challenges but also great opportunities for the country's human development. Since energy is one of the principal factors for social inclusion and productivity, the GRUN has aligned its energy policy with its National Human Development Plan (PNDH). It also coincides with the UN's SE4ALL initiative. The energy policy centres on the three following axes:

- Universal access to modern energy services;
- Transformation and diversification of the energy mix; and
- Energy efficiency.

Specifically, the strategy pursued by the GRUN to meet the challenges of the energy sector includes: (i) reducing the reliance on fossil fuels for electricity generation; (ii) expansion of private sector investment in renewable electricity generation and sustainable use of biomass; (iii) expansion of electricity coverage; (iv) promotion of energy efficiency programs; (v) loss reductions in the national electric system (SIN); and (vi) maximizing the opportunities presented by the interconnected Central American electric system (SIEPAC). Due to its renewable energy potential and geographic position, SIEPAC offers significant prospects for Nicaragua in the Regional Electricity Market (MER).

Over the past seven years, the GRUN has accelerated its electrification efforts and achieved a significant improvement in the electricity coverage rate. Nicaragua's electricity infrastructure nonetheless still presents major challenges to overcome; at year-end 2013, 76.2% of Nicaraguan households were electrified, i.e. an estimated 1.4 million people did not have access to electricity. This represents a major barrier to economic development and also indicates that the electrification target agreed by the Central American countries through SICA (90% coverage in all countries by 2020) remains distant for Nicaragua. For the rest of Central America the coverage rate ranges from 82% in Guatemala to 99% in Costa Rica.

Note that the overall coverage rate hides large variations between rural areas and urban centres, areas that are connected to the SIN and those that are supplied by isolated systems, etc. In general terms, the coverage is close to 100% in cities, 40-60% in most rural areas, and 20-0% in parts of the Autonomous Caribbean Regions and the department of Jinotega. In summary, the majority of the 1.4 million people who do not have access to electricity live in rural areas.

In terms of the transformation of the energy mix, the efforts are reflected in Figure 3, which
The GRUN is committed to the transformation of the energy generation mix and has thus set ambitious goals for the use of the country's untapped renewable resources: the goal is to reach 91% renewable share by 2027. Considerable potential for renewable electricity generation

remains; the country currently exploits only 10.2% of its potential. Reaching renewable generation potential will require ambitious financing programs, policies and regulatory measures.

In addition to the large-scale use of renewable resources for electricity generation, the GRUN has initiated the strategic planning of renewable energy for domestic and productive uses. Approximately 900,000 Nicaraguan households cook with firewood on traditional stoves, adversely affecting the national health and environment. Firewood consumption reached 44.4% of the total final energy consumption in 2012, surpassing oil. Consequently, the MEM developed the Firewood and Charcoal Strategy (ENLCV) of Nicaragua for 2012-2022 and is now finalizing a National Program for Sustainable Use of Firewood and Charcoal for 2014-2022, which will promote and facilitate the access to modern energy services for cooking and productive uses.

Rationale for Selected Sectors for SREP Funding

The PNDH for 2012-2016 establishes the strategic policy framework for the sustainable development of the country. The policies therein aim to address Nicaragua's main environmental challenges, many of which are related to electricity access and the energy mix, including; dependency on fossil fuels, deforestation, climate change, poverty and fragile urban and rural infrastructure. This section explores possible sectors in the energy landscape where SREP resources could assist Nicaragua in overcoming these challenges through provisions of financial and/or strategic support.

Geothermal Energy

Nicaragua has the highest estimated geothermal potential of Central America. The exact potential is unknown, but has been estimated at 1,500 MW. Regrettably, only 10% of this is exploited despite a number of private developers having shown interest in investing. The sector's major challenge is to mobilize private venture capital, which is needed in the early stages of geothermal exploration to confirm the resource potential and commercial viability of new fields. To attract private investments, public sector participation is necessary to decrease the private risk capital share and inspire greater investor confidence. In particular, several medium and low enthalpy areas need to be brought from recognition to pre-feasibility stage.

If Nicaragua is to reach its ambitious 91% renewable energy share goal by 2027 (and 95% by 2030 according to the preliminary SE4ALL Action Plan goals) without compromising safety of supply, it is crucial to increase the share of stable geothermal based power generation to counter other intermittent renewable resources. SREP resources could enable the Nicaraguan state to actively move forward with new geothermal explorations and leverage much needed private investments for the sector.

Topics

- Financial schemes adapted to geothermal exploration
- Resource potential studies for both high and low enthalpy areas

Rural Electrification

Even if all the electrification goals of the PNESER are met, 14% of the Nicaraguan population – close to one million inhabitants – will remain without access to electricity in 2020. Through the PLANER initiative the GRUN is devising a long-term strategy for bringing electricity to this part of the population, which largely live in regions where the only techno-economically viable electrification

model is isolated installations, mostly with solar photovoltaic (PV) technology. Execution of the solar PV components of the PLANER will require substantial funding that is currently not in place, as well as private-public models to which SREP could provide catalytic seed funding.

Topics

- Funding of solar PV installations for rural electrification
- Financing of rural energy service companies (ESCOs)

Access to Modern Energy Services for Cooking and Productive Uses

Continuing the strong commitment and political will to achieve sustainable development and promote improved quality of life, the GRUN promotes sustainable use of wood through the ENLCV. According to MEM, approximately 60% of the total population cooks with firewood on traditional stoves; this is detrimental to health and the environment. Aware of the challenge, the MEM is in the process of promoting a National Firewood and Charcoal Program for 2014-2022. One of the objectives of the Sustainable Energy Strategy 2020 of the SICA is to distribute a million improved cook stoves by 2020. As these require 20-40% less fuel, the initiative will contribute to the reduction of firewood consumption in the region by 10%.

Topics

- Facilitate the adoption and transfer of 400,000 improved cook stoves
- Promote climate friendly technologies in SMEs that use wood in productive processes

Small scale hydro power

The interconnection of distributed generation from scattered small hydroelectric developments (less than 1 MW) at medium and low voltage levels would be beneficial for the transformation of the generation mix, as well as for grid stability and power quality. The resource potential is available, but can only be exploited if a number of commercial, regulatory and technical challenges are addressed. Among others, the current tariff structure, lack of skilled locally based personnel to operate the plants, technical interconnection issues etc., are factors that add up to an unfavourable investments climate for small scale hydro power. One concrete obstacle to the replication of small-scale hydro developments in Nicaragua that SREP could help to diminish is financing. Financing terms above ten years for small-scale hydro are not available, and interest rates are generally too high for returns on investments to be satisfactory.

Topics

- Long-term funding for small scale hydro power developments
- Legal and regulatory framework for small-scale distributed generation

Biogas for Domestic & Productive Uses

Considering that agriculture and livestock are two of the main economic activities in Nicaragua and that there has been an increase in urban solid waste generation, it is of strategic value to assess the feasibility of exploiting the waste for biogas generation. For these reasons, the MEM has developed action plans for the promotion of biogas from waste as an alternative source of renewable energy.

Topics

- Support existing biogas promotion initiatives
- Develop a market mechanism, policies and regulatory framework that allows a progressive consolidation of the biogas sector

Thermal Use of Solar Energy

Nicaragua has high solar energy potential, which can be exploited for heating water in different sectors of the country: health (hospitals), tourism (hotels) and industries. Furthermore, the availability of the sun throughout the country provides the additional opportunity to promote the decentralized use of solar energy for productive uses to promote rural development. Specifically, the GRUN seeks to facilitate the adoption and transfer of clean technologies for domestic and productive uses of solar energy, among which are: Solar thermal systems for water heating or steam generation, solar PV systems (with wind) for: irrigation pumping, pumping drinking water, cooling systems and communication.

Topics

- Baseline studies and study investment prospects
- Investments in solar thermal energy

SREP involvement in any of these five proposed sections will contribute to achievable, climate friendly, equitable, inclusive, lasting, and measurable and poverty reducing social benefits for the Nicaraguan population. Nicaragua lags behind all of the Central American countries on important indicators such as electrification rate, energy intensity and relative poverty, but the GRUN considers that significant and sustainable progress – hand in hand with economic growth – can be achieved through ambitious renewable energy investments. Concretely, SREP funding would:

- Catalyze the attraction of venture capital to early stage geothermal developments. Nicaragua must exploit more of its geothermal resources if the 90% renewable energy by 2020 target is to be met, but investors are hesitant to move in unless the GRUN participates in explorations, for which external funds are required. In summary, SREP investment in geothermal exploration can give a high MW/$ and MWh/$ return;
- Bring modern electricity services to a portion of the more than 900,000 Nicaraguans that are not considered in current electrification schemes and that largely coincide with the most marginalized parts of the Nicaraguan society;
- Significantly improve the living conditions of an estimated 3.6 million Nicaraguans (60% of the population) that are exposed to hazardous indoor environments caused by firewood cooking on traditional cook stoves – this particularly harms women and children. Improvement of cook stoves would also help to decrease deforestation;
- Promote new small scale hydro power developments, thus increasing the renewable energy share;
- Foster the eco-system for bioenergy systems and prepare for the replacement of 10% of Nicaragua's gasoline usage and 5% of its diesel usage with ethanol by 2020 in line with the country's commitment; and
- Promote the exploitation of solar thermal energy for productive uses to drive rural development.

7.3.2 Haiti

Country and Energy Sector Context

With a nominal GDP per capita of US$771 in 2012 (source: World Bank, 2013), Haiti is the poorest – and only Fragile – country in the Americas and in the Western Hemisphere. In addition to causing over 200,000 deaths and a major setback to the economy, the 2010 earthquake that hit the metropolitan area engendered major demographic movements and deepened the already existing vulnerabilities. Despite the spectacular rebound of the country's growth rate thanks to the impulsion of its dynamic Administration elected in 2011, Haiti was still ranked far below its regional neighbours (161st globally) on the UN"s 2013 Human Development Index.

Haiti has the lowest per capita electricity consumption in the LAC region. At 21kWh per year, per capita consumption is more than 80 times lower than the average for the region, reflective of the very low income levels and access to electricity services.

Haiti's current electricity infrastructure is aging and has been poorly maintained. The 54 MW Péligre hydropower station, the nation's largest power plant, is operating at only half capacity due to disrepair and sedimentation caused by increasingly severe deforestation. Available generation capacity of approximately 212MW (85% diesel, 15% hydropower) is insufficient to meet an estimated peak demand of more than 250MW in the metropolitan area. The power system's technical and commercial losses – respectively 30% and 35% - largely contribute to this structural deficit, resulting in an average daily service of only 16 hours on the power networks.

Access to electricity is estimated by Government of Haiti's (GOH) internal surveys at 28% (6% in the rural areas), leaving about 7 million Haitians without basic energy services and with little access to economic development opportunities.

Despite a significant proven potential in hydroelectricity, wind and solar energy (see Annex 1), and the high cost of the imported petroleum products[7], this access rate remained fairly constant over the last thirty years, mainly due to an inadequate enabling framework: only 35 mini-grids are installed and operating, in addition to the 5 isolated grids in the large provinces cities.

The Government of Haiti (GOH) has emphasized the need to use more efficiently conventional fuels in order to reach faster its economic development targets and become an emerging country by 2030. To address the energy demand growth associated with this vision (energy demand to double in the next decade, objective of full access to reliable energy for the expected 15 million people by 2030), GOH is highly committed to promoting the development of indigenous renewable energy sources. Upon his arrival in Office in May 2012, Prime Minister Lamothe declared in his General Policy address that the country will reach the target of having "25% of the national electricity mix from renewable energy sources by 2020".

In the interim version of the National Energy Sector Development Plan (MTPTEC, February 2011), the Haitian government has identified wind power as a national priority, determining that the resource should be developed wherever there is evidence that it may be economically viable. MTPTEC has since allowed private promoters to conduct pre-feasibility studies for wind projects in specific sites.

In January 2012, GOH announced the ambitious goal of electrifying 200,000 rural households over

the next three years through the "Banm limyè, Banm lavi" program ("Give me light, give me life", in French Creole). At an estimated cost of USD 30 million, about two-thirds of which would be awarded by Haitian banks via long-term loans, the program aims to provide much- needed electricity mostly through solar technology. Although the feasibility and status of this initiative remain challenging, it indicates a concrete involvement from the GOH that the future of Haiti's electricity sector must also be based on renewable energy, not just a greater dependence on imported fossil fuels.

Lately, the MTPTEC translated GOH‟s vision on energy into a comprehensive Energy Directions Note, notably providing concrete action items to enhance the use of renewable energy sources in the next two years. The strategy note has been endorsed by the Cabinet on September 15, 2013.

Rationale for Selected Sectors for SREP Financing

Support for renewable energy has gained momentum since 2010, both from the public and private sectors, creating a market case for some equipment using renewable energy (e.g., solar lanterns). Nevertheless, and despite the numerous project proposals and expressions of interest, there is as of now no existing on-grid wind or solar project in Haiti. The electricity sector's poor performance, lack of planning and outdated regulatory framework are the main factors impeding the development of renewable energy in Haiti.

The Electricity Sector Organic Law of 1989 is still the law organizing the sector, and has not been reformed or amended since it came into effect. The absence of feed-in tariffs for the renewable energy sources, the monopoly of the state utility Electricity of Haiti (EDH) on power distribution and sales and the absence of rules for new connections to the grid lead to a legal vacuum in which private promoters and donor countries / multilaterals experienced major difficulties to prepare, advance and implement renewable energy projects.

With 65% of power distribution total losses, the highest power generation cost of the Western hemisphere and inadequate electricity tariff levels, the Haiti power sector is in a situation of structural deficit, requiring about US$ 200 million of yearly budget transfers to EDH (4% of the national budget). This represents a major hurdle for any renewable energy project promoter aiming to obtain a power purchase agreement with EDH with the GOH‟s guarantee (60% of the installed capacity is privately owned).

These barriers are being addressed by the Rebuilding Energy Infrastructure and Access project (PRELEN project, a US$ 90 million grant from the World Bank to the GOH, effective since February 2013), under the component "Technical Assistance to the MTPTEC". While rehabilitating the distribution grids and assisting EDH in its commercial performance improvement, the project is also currently financing the electricity sector 2015-2030 master plan and provides assistance to the MTPTEC‟s newly created Energy Cell to reform the regulatory framework and promote the use of renewable energy.

SREP financing would ideally and timely complement this technical assistance to MTPTEC funded by the World Bank grant, by (i) contributing to the financing of renewable energy pilot / demonstration projects (using partnering with the private sector and regulation by contract, as needed), (ii) catalysing the implementation of a new and enabling regulatory framework for renewable energy development, and (iii) developing mechanisms to leverage private sector's participation in the subsequent renewable energy projects as well as energy access projects.

The timely implementation of an on-grid wind or solar photovoltaic project supported by SREP with the use of the long term master plan to develop a national energy strategy on renewable energy development would be invaluable elements to activate a sound and incentivizing regulatory framework on renewable energy in Haiti. For this to happen, a successful pilot initiative is critical to confirm to the promoters GOH‟s willingness to tap in the important renewable energy potential in a viable and sustainable manner; it would also allow addressing the – wrongly funded - internal resistance on renewable energy in the public administration.

APPENDIX A:

CRITERIA FOR SELECTING COUNTRY AND REGIONAL PILOTS UNDER THE PROGRAM FOR SCALING UP RENEWABLE ENERGY IN LOW INCOME COUNTRIES

Revised February 26, 2014

CRITERIA AND PROCESS FOR SELECTING NEW PILOT COUNTRIES UNDER THE SREP

I. INTRODUCTION

1. At its meeting on October 31, 2013, the SREP Sub-Committee reached the following decision regarding the approaches and criteria for considering potential new pilot countries:

> The Sub-Committee agrees in principle to open the SREP to new countries while recognizing that funds could also usefully be utilized to deepen programs in existing pilot countries or to expand the SREP set aside for enhancing engagement with the private sector.
>
> The Sub-Committee also agrees that, in order to advance consideration of new countries:
>
> a) The CIF Administrative Unit should invite countries eligible for SREP funding to submit an expression of interest in participating in the SREP, based on a template to be prepared by the CIF Administrative Unit in collaboration with the MDBs;
>
> b) An expert group should be established as soon as possible thereafter to review the expressions of interest and recommend new countries, using the previously agreed selection criteria and process as a basis;
>
> c) The expert group is invited to identify up to 12 new countries that could benefit from the SREP program while contributing to the overall programmatic objectives of SREP;
>
> d) Countries selected by the Sub-Committee would be provided with initial funding to prepare their full investment plans; and
>
> e) In selecting new countries, (i) focus should be given to energy access, noting the particularly low level of energy access in Africa, and (ii) allocation of indicative resources should be based on country characteristics.
>
> The Sub-Committee further agrees that should funds be allocated to new countries, priority should be given to reserve countries, without necessarily prohibiting new countries from moving forward.

2. The current paper outlines the criteria and process for selecting potential new countries under the SREP using the previously agreed selection criteria and process as a basis.[1]

II. PROPOSED CRITERIA

3. In selecting the initial SREP pilots in 2010, the Sub-Committee considered two perspectives: (i) a country's willingness to meet the criteria and to achieve the objectives of the SREP, and (ii) a country's potential and capacity to implement a SREP program. In addition, regional balance and natural conditions for developing renewable energy were included as part

[1] See *Criteria for Selecting Country and Regional Pilots under the Program for Scaling up Renewable Energy in Low Income Countries*, March 26, 2010.

of the criteria.

4. It is proposed that the previously agreed criteria be used as a basis for considering new SREP pilot countries, with some modifications reflected in the criteria below. Furthermore, it is proposed that information submitted by the eligible countries in their expressions of interest be taken into account in ranking the countries against the criteria and that weights be assigned to the proposed criteria to be applied by the expert group in its review and scoring of the expressions of interest.

5. Below are five criteria (two quantitative and three qualitative) with weightings proposed for selecting new SREP pilot countries:

a) Lack of energy access (weight: 30%). This will be measured in terms of percentage of total population with access with electricity. Countries with the lowest access to electricity should be favored. Data from public sources will be compiled.

b) Relative poverty (weight: 10%). This will be measured using gross national income (GNI) per capita. Data from public sources will be compiled.

c) Enabling environment (weight: 30%). This will involve three aspects as elaborated below:

i. the existence of, or a willingness to, adopt, within an appropriate timeframe, supportive regulatory structures and institutions to support renewable energy development (including agencies to promote/utilize renewable energy, if relevant). This could include policies and regulations promoting renewable energy, such as feed-in tariffs, tax incentives, subsidies, concessional financing or renewable portfolio standards.

ii. an enabling regulatory environment that promotes private sector investments in renewable energies. This could include policies that support private sector participation and public-private partnerships. This could also include availability, or willingness to develop, local capacity along the renewable energy supply chain, including manufacturing, training, and operations and maintenance.

iii. sector-wide energy development strategies that are open to integrating renewable energy into energy access and supply enhancement programs or targets for large-scale renewable energy deployment. Countries could be assessed on national and local strategies and targets for electrification, and current or projected share of renewables in the energy portfolio.

d) Good governance within the sector (weight: 10%). An assessment of sector governance could include commercial performance of relevant institutions, pricing and tariff practices, and competitive procurement of goods and services,

the transparency and accountability of these practices and the degree to which they are subject to public oversight.

e) Potential capacity for implementation, including sufficient institutional and technical capacity (weight: 20%). This could include a track record of renewable energy projects completed or initiated with participation of private sector, previous experience implementing and using renewable energy technologies, capacity for operating and maintaining renewable energy systems. In specific cases, the existence of a track record may not be a strict criterion and a willingness to advance in the area of renewable energy could be sufficient. The government's ability to effectively absorb additional funds should also be considered.

6. Regarding regional balance for the selection of new SREP pilot countries, it is recognized that the emphasis is to be placed on the opportunities to increase energy access noting the particularly low level of energy access in Africa. It is further recognized that from the perspective of sharing knowledge and lessons SREP can benefit from including a diverse group of countries and regions. The Sub-Committee suggests that the expert group, taking these considerations into account as well as the submitted expressions of interest, recommend a significant number of countries from Africa (it is proposed at least 8 out of 12) and that the remaining recommended countries should include representation from the other regions (South and East Asia and Pacific, Europe and Central Asia, and Latin America and Caribbean; see Annex 1 for a list of eligible countries by region). The Sub-Committee will reach a decision on the identification of new countries that could benefit from the SREP program only after due consideration of the expressions of interest submitted by eligible countries as well as the scoring and recommendations to be provided by the expert group.

III. PROPOSED PROCESS

7. The CIF Administrative Unit will invite eligible countries to submit an expression of interest in participating in the SREP in accordance with the outline presented in Annex 2. The CIF Administrative Unit will invite the members of the expert group constituted in 2010 to reconvene to review the expressions of interest received, score the countries, and recommend to the Sub-Committee 12 new countries that could benefit from the SREP program.

8. In presenting its recommendations to the SREP Sub-Committee, the expert group is requested to elaborate how it has taken the above criteria and other considerations into account in preparing its list of potential new pilot countries. The expert group report should include, inter alia, information on:

a) Methodology (including a score card) and analysis leading to the group's list of proposed new pilot countries; and

b) An assessment of key issues and challenges for the identified pilot countries.

9. The Sub-Committee will review the report of the expert group at its meeting in June 2014

and is expected to make a decision at that meeting. See Annex 3 for a proposed timeline for selecting new SREP pilot countries.

Annex 1: List of Eligible Countries

A country is eligible for participating in SREP programs if it is:

a) An IDA-only country or a regional development bank (RDB)'s equivalent (see below);
b) Engaged in an active MDB country program. For this purpose, an "active" program means where an MDB has lending program and/or ongoing policy dialogue with the country.

Below are definitions of eligibility for IDA (International Development Association – the World Bank fund for the poorest) and RDB's equivalent.

World Bank

Countries are eligible for IDA on the basis of (a) relative poverty and (b) lack of creditworthiness. The operational cut off for IDA eligibility for FY14 is a 2012 GNI per capita of USD 1,205, using Atlas methodology. To receive IDA resources, countries must also meet tests of performance. An exception has been made for small island economies. In exceptional circumstances, IDA extends eligibility temporarily to countries that are above the operational cut off and are undertaking major adjustment efforts but are not creditworthy for IBRD lending.

African Development Bank

Countries are eligible for ADF (African Development Fund) on the basis of (a) relative poverty and (b) lack of creditworthiness. The operational cut off for ADF eligibility for FY14 is a 2012 GNI per capita of USD 1,205, using Atlas methodology.

Asia Development Bank

ADF (Asian Development Fund) countries are defined as countries that have access to the ADF. These countries have the greatest development challenges and are eligible to receive very low interest loans and grants. Borrowers' eligibility for ADF is based on two criteria: (1) per capita gross national income (GNI) and (2) creditworthiness for ordinary capital or market-based resources. ADB uses World Bank's per capita GNI estimates based on the Atlas method and IDA's operational cut off for eligibility.

European Bank for Reconstruction and Development

In early 2004, EBRD launched a new initiative to increase its activities in the Early Transition Countries (ETCs). The initiative aims to stimulate economic activity in EBRD's countries which still face the most significant transition challenges: Armenia, Azerbaijan, Belarus, Georgia, Kyrgyz Republic, Moldova, Mongolia, Tajikistan, Turkmenistan and Uzbekistan. More than 50 per cent of the people in these countries live below the national poverty line.

The initiative aims to stimulate market activity in these countries by using a streamlined approach to financing more and smaller projects, mobilizing more investment, and encouraging

ongoing economic reform. The initiative builds on international efforts to address poverty in these members of the Commonwealth of Independent States (the former Soviet Union).

EBRD will accept higher risk in the projects it finances in the ETCs, while still respecting the principles of sound banking. To increase its investments in these countries, EBRD has allocated more staff to work on ETC projects and has created a new team dedicated to the initiative.

For the purpose of SREP eligibility, four ETC countries are not considered for reasons listed below: Uzbekistan (no energy lending program), Turkmenistan (no energy lending program), Belarus (private sector engagement only, therefore no possibility to affect renewables regulatory framework), and Azerbaijan (very weak enabling environment for renewables due to the structure of the power market).

Inter-American Development Bank

After the last debt relief by the IDB in 2007, the IDB Board of Governors approved the Debt Sustainability Framework and Enhanced Performance-Based Allocation (DSF/EPBA) to guide concessional lending. Under this framework, the total volume and the concessionality of IDB lending for each country are determined through blending highly concessional resources from the Fund for Special Operations (FSO) with Ordinary Capital (OC). Four countries (Bolivia, Guyana, Honduras, and Nicaragua) get FSO and OC resources blended in a pre-defined proportion and cannot have access to OC alone. A fifth country (Haiti), which traditionally also received concessional resources though the FSO, receives exclusively grant financing through the IDB grant facility since 2007. These five countries, called "D2 countries" by IDB, are considered IDB's equivalents of IDA-only countries.

Below is a list of SREP eligible countries (IDA-only countries plus similar RDB's equivalent) to be invited to express interest in participating in SREP (total = 55):[2]

Africa (33)

- Benin
- Burkina Faso
- Burundi
- Cameroon
- Central African Republic
- Chad
- Comoros
- Congo, Democratic Republic of
- Congo, Republic of
- Cote d'Ivoire
- Djibouti
- Eritrea

[2] The current SREP pilot countries are excluded from the list: Armenia, Ethiopia, Honduras, Kenya, Liberia, Maldives, Mali, Mongolia, Nepal, Solomon Islands, Tanzania, Yemen, and Vanuatu. Nigeria is also excluded from the list as it is already participating in the Clean Technology Fund.

- Gambia
- Ghana
- Guinea
- Guinea-Bissau
- Lesotho
- Madagascar
- Malawi
- Mauritania
- Mozambique
- Niger
- Rwanda
- Sao Tome and Principe
- Senegal
- Sierra Leone
- Somalia
- South Sudan
- Sudan
- Togo
- Uganda
- Zambia
- Zimbabwe (AfDB's equivalent)

South and East Asia and Pacific (13)

- Afghanistan
- Bangladesh
- Bhutan
- Cambodia
- Kiribati
- Lao People's Democratic Republic
- Marshall Islands
- Micronesia, Federated States
- Myanmar
- Nauru (ADB's equivalent)
- Samoa
- Tonga
- Tuvalu

Europe and Central Asia (5)

- Georgia (EBRD's equivalent)
- Kosovo
- Kyrgyz Republic
- Moldova (EBRD's equivalent)
- Tajikistan

Latin America and Caribbean (4)

- Bolivia (IDB's equivalent)
- Guyana
- Haiti
- Nicaragua

APPENDIX B

OUTLINE OF EXPRESSION OF INTEREST TO PARTICIPATE IN SREP

I. COUNTRY AND GOVERNMENT AGENCY SUBMITTING EXPRESSION OF INTEREST

II. DESCRIPTION OF THE COUNTRY AND ENERGY SECTOR CONTEXT

Please provide a summary of the country and energy sector context, including resource potential for deploying renewable energy, status of energy access (population with access to electricity), renewable energy policies, targets, and implementation measures.

III. RATIONALE FOR SELECTED SECTORS FOR SREP FINANCING

Please identify barriers for the deployment of renewable energy, potential sector, sub-subsectors, and technologies for possible SREP financing as well as the rationale for prioritizing them for SREP interventions.

IV. ENABLING POLICY AND REGULATORY ENVIRONMENT

Please provide an overview of the existing policies, legal framework, market and regulatory structure for renewable energy development and the potential impacts of public and private sector interventions in addressing the barriers. Discuss the existing regulatory environment for attracting private investments in renewable energy technologies and governance within the energy sector, including commercial performance of relevant institutions, pricing and tariff practices, competitive procurement of goods and services, the transparency and accountability of these practices and the degree to which they are subject to public oversight.

V. INSTITUTIONAL AND TECHNICAL CAPACITY

Please provide an analysis of the institutional and technical capacity for implementation, including the government's ability to effectively absorb additional funds. Please also provide a preliminary assessment of potential implementation risks.

VI. PROGRAMS OF MDBS AND DEVELOPMENT PARTNERS

Please describe briefly the ongoing and planned programs of the relevant multilateral development banks (MDBs) and other development partners relevant to energy access and renewable energy and how the proposed interventions for SREP would link to and build upon these programs.

APPENDIX C

SREP EXPERT GROUP

May 5th 2014

Expertise	Expert	Title, Organization	Country
Environment and Climate Change Specialist	Stephen Thorne	Director, South South North Project	South Africa
Private Sector Specialist with Experience in Energy Sector	Michael Allen *(Rapporteur)*	Independent Consultant	New Zealand
Renewable Energy Technologies Specialist	Oscar Coto *(Co-Chair)*	Principal, Energía, Medio Ambiente y Desarrollo, EMA S.A.	Costa Rica
Rural and Urban Electrification Specialist	Govind Raj Pokharel	Manager for Pakistan, Indonesia, and Bangladesh Programmes, SNV Netherlands Development Organisation	Nepal
Social and Gender Development Specialist	Richenda Van Leeuwen *(Co-Chair)*	Consultant	United States and United Kingdom

APPENDIX D

SREP EXPERT GROUP MEETING

May 12-16th 2014
Washington, D.C.

SUMMARY OF WORK PROGRAM

Monday, May 12th

[Note that Govind Pokharel was only available during earlier morning hours each day through a phone link to Kathmandu]

- Organization of work of the Expert Group including discussion and agreement on methodology and working modalities
- Development of approach to "scoring" for countries
- Review and discussion of EOI and additional background information

Tuesday, May 13th

- Continuation of review of EOIs and commence entering scores

Wednesday, May 14th

- Conference call and face-to-face meetings with MDB representatives: World Bank, IFC, IDB in Washington; AfDB, EBRD, IFC on call in. (See notes below).
- Review of EOI assessments, cross checking and verification of consistency to scoring

Thursday, May 15th

- Continued cross checking and verification of consistency to scoring
- Critical review of analysis and recommendations
- Determination of recommendations

Friday, May 16th

- Write up of work

APPENDIX E

LIST OF MDB PARTICIPANTS

Meeting / Conference Call between MDB Representative and SREP Expert Group
9.00am to 10.30am
May 14th 2014

External Participants:

ADB Jiwan Acharya, Sr. Climate Change Specialist

AfDB Mafalda Duarte, CIF Coordinator and Chief Climate Change Specialist

EBRD Andreas Biermann, Principal Policy Manager

IADB Claudio Alatorre, Sr. Climate Change Specialist
Jose Emiliano Detta

IBRD Gevorg Sargsyan, Program Manager, CTF and SREP
Gunta Niparte

IFC Joyita Mukherjee, Sr. Operations Officer
Laura Gaensly Cordeiro, Operations Officer

CIF Zhihong Zhang, Sr. Program Coordinator, CTF and SREP
Tao Wang, Sr. Operations Officer