Annex 6

Information Note on "Guidelines for the demonstration of additionality of microscale project activities"

I. Background

1. This note is in response to the request from the Board at its sixty-second meeting (see paragraph 48 of EB 62) as below:

   (a) The Board requested that the SSC WG analyses the implications associated with the implementation of the 5 per cent threshold specified in criteria 2 (d) of the Guidelines for the demonstration of additionality of microscale project activities. Based on the outcome of this analysis, the SSC WG was also asked to propose an alternative threshold, if that is deemed to be more appropriate;

   (b) The Board further requested that the SSC WG propose options for defining the recommended threshold with rationale and implications of the implementation of these options;

   (c) The SSC WG was also tasked to assess the need and options for the inclusion of off- grid electricity generation in the total "National annual electricity generation" referred to under paragraph 48 (b) and make recommendations to the Board accordingly.

II. Limitations of recommendations from SSC WG

2. The SSC WG notes that there is limited information available on the installed capacity of and the electricity generation by renewable technologies in developing countries. In addition, there is no uniform agreement on how penetration rates are defined or at what penetration rate a technology can be considered mature. Thus, the analysis completed by the SSC WG includes both subjective as well as objective elements.

III. Thresholds and LDCs

3. All LDCs and SIDs that are parties of the Kyoto protocol are covered under criteria 2(a) of the guidelines. Thus, in approximately 70 countries renewable energy project activities up to 5 megawatts are considered to be additional with no need to show compliance with any further criteria. Therefore, criteria 2(d) only applies to the rest of the non- Annex I countries (approx. 70).

IV. Summary of Recommendations

4. The SSC WG recommends that the Executive Board establish a positive list of renewable electricity generation technologies that are automatically defined as additional, without further documentation of barriers, in all non-Annex I countries. The list would consist of the following technologies of installed capacity 5 MW or under :

   (a) All grid connected Solar technologies (PV and solar thermal electricity generation);

(b) Grid connected Off shore wind technologies;
(c) Grid connected Marine technologies (wave, tidal)

5. The SSC WG recommends that the Executive Board establish the threshold for any renewable electricity generation technology (not on the positive list) to be considered automatically additional, where the installed capacity (in MW) of the renewable energy technology as a percentage of total grid connected installed capacity (in MW) in the host country, does not exceed a percentage X%. The SSC WG recommends that X should be a value between 2% and 5%, to be chosen by the Board. Preliminary analysis of implications (for some technologies) of the choice of a threshold are reflected in figure 6 and figure 7 of Annex 1 to this document. This approach based on installed capacity will be more conservative than the approach based on energy generation indicated in the current version of the guideline. Projects that utilize technologies that have a higher penetration rate in the host country can, of course, still be additional if they meet the requirements of the conventional additionality tests.

6. That the "National annual electricity generation (capacity)" continues to refer to grid connected electricity only without consideration of off-grid electricity generation. The SSC WG suspects that the inclusion of off grid electricity generation data will not be significant and that in any case, the availability of reliable off-grid capacity data is limited.

7. The SSC WG also recommends that the Board consider extending the positive list of technologies referred above in paragraph 4 to installed capacities upto 15 MW (SSC threshold) as the rationale indicated in the paragraph 13 and 14 below would still hold for these higher capacity ranges.

8. The SSC WG also recommends that the Board consider extending the positive list to include off-grid electricity generation technologies and distributed generation activities (criteria 2.b and 2.c).

V. Analysis

A. Positive Lists

9. The 5% threshold for the contribution from specific renewable energy technologies (e.g. solar electricity, wind electricity) to the national annual grid connected electricity generation is indicated in the current version of the guidelines as the limit for qualifying micro scale additionality under criteria 2(d). The SSC WG has so far found only a paucity of publicly available data about the penetration rates and growth rates of specific renewable technologies in developing countries. In addition, when data are available they are usually not current (or up-to-date) and in some cases information is not consistent across sources. The SSC WG was also unable to find reports indicating what penetration rate is indicative of when a renewable or energy efficiency technology is cost-effective and has overcome barriers to become a common practice. The most relevant document found was a 2005 report by Kartha, Lazarus and Le Franc titled "Market penetration metrics: tools for additionality assessment"

10. Therefore, it is difficult to determine what capacities and penetration rates are indicative of mature technologies. Without more data it is not be feasible to have a quantitative assessment of the relative validity and implications of the implementation of the percentage threshold. However, in the absence of reliable publicly available country specific and technology specific data the SSC WG considered aggregated data such as those annexed to this document (see figures 1 and 2 in Annex 1 which are excerpts from REN21. 2011. *Renewables 2011: Global Status Report*. Paris:REN21 Secretariat, the aggregate contribution of renewables ranges from 0 to 64%).

11. The SSC WG is of the view that the current 5% criteria may not be the most appropriate indicator of barriers to renewable energy (RE) deployment on a standalone basis, on the one hand most microscale RE technologies from most countries would currently qualify, while on the other hand some technologies in some countries will be excluded from automatic additionality today and in future due to efficient implementation of ambitious targets for deployment of certain RE technologies not necessarily due to removal of barriers. Those that get excluded may still be facing barriers due to factors related to maturity and price of the technologies, for example cost of electricity generation from solar technologies is expensive today and continues to be expensive in future relative to other more mature RE technologies and fossil fuels (see figure 4 and figure 5).

12. The SSC WG considered other characteristics, such as penetration of a RE technology as a percentage of technical, market or economic potential. However, there appears to be virtually no reliable data on this metric. Thus, the SSC WG then looked at relative cost competitiveness of RE technologies as a possible indicator of the maturity of these technologies and reviewed information on the costs of electricity generation from renewable technologies of small capacity from the following sources: see figure 3, figure 4 and figure 5.

13. With reference to Figures 3, 4 and 5, it is seen that the electricity production costs of some small capacity, renewable technologies (specifically small hydro, on-shore wind, biomass power, and geothermal power) can be comparable in cost to fossil fuel generation. On the other hand, some technologies are currently and in future projections, under all scenarios are always more expensive (specifically electricity from off shore wind, solar, marine).

14. Thus, the SSC WG therefore concluded that the competitiveness of grid-connected microscale RE technologies can be used to determine additionality via the use of a positive list that is updated in regular cycles as new generation cost data become available. A positive list of RE technologies therefore would supplement threshold criteria for other technologies requiring a case by case analysis.

B. Penetration Rates

15. The SSC WG debated what penetration rates to use for defining additionality. With little to no data on what constitutes a level of market penetration that indicates a mature technology the SSC WG reviewed AM 0086, which indicates a penetration rate of 1% as an additionality test for water purifiers and the above referenced Kartha et. al. report that provides these conclusions:

"The foregoing discussion suggests that a generic penetration rate threshold:

- Which is much higher than 5% could result in deeming some technologies additional that are already well-established and commercial, which might generate considerable amounts of unwarranted GHG credits, especially in large sectors such as electricity or transport.
- Which is below 2% might deem as non-additional marginally commercial technologies that depend on incentives such as those provided by GHG credit markets for greater diffusion.
- Will be more effective if the threshold is designed for the specific market or sub-market.
- As a definitive, stand-alone metric, may not be a satisfactory test for additionality."

16. We thus agree that a 2% to 5% penetration rate criterion makes for a good initial screen in that technologies below this penetration rate should be considered additional, and technologies above this penetration rate should utilize existing small scale, or large scale, additionality tests.

C. Ratio of Installed Capacities

17. The SSC WG analyzed two possibilities:

    (a) Calculating the ratio as the total installed capacity of the specific microscale technology (=< 5 MW capacity) divided by the total installed capacity of all electricity plants connected to the grid in the host country.

    (b) Calculating the ratio as the total annual generation of the specific microscale technology (=<5 MW capacity) and total electricity generation supplied to the grid in the host country.

18. The SSC WG concluded that option (a) would be more appropriate. The electricity generation from renewable technologies is subject to annual variations due to the availability and fluctuations of the resources used by the technologies. Therefore calculations based on capacity ratios would provide more stable values as they will not be influenced for the conditions of a particular year. In addition generally data on installed capacities of technologies are suspected to be more available than data on generation, although in some instances available reports seem to indicate otherwise.

19. The SSC WG also concluded that if option (a) is adopted, the calculation would be more conservative than the calculation based on electricity generation, as in general the load factor of renewable technologies is lower than the one for of fossil fuel based technologies. For examples typical values of load factor for wind technologies are in the range of 20 to 30% while for fossil fuel technologies, the load factor is in general higher than 70%.

D. Penetration of Microscale Generation Versus All Generation of the Same Technology

20. The SSC WG also assessed the implications of determining the 5% threshold as the ratio of the installed capacity of the microscale technology and the total installed capacity of the same technology. For example, the total installed capacity of

hydropower plants with capacity less than 5 MW divided by the total installed capacity of hydropower plants in the host country. The SSC WG is of the opinion that, considering that this option is not related to the penetration of the specific microscale technology in the grid, nor to the overall penetration of that particular renewable technology irrespective of its size, it may not be very appropriate for this analysis. Further the ratio of small capacity hydro electricity generation and electricity generation by total capacity of hydro plants in the host country will not give information that could be used to assess the additionality of the microscale renewable technology i.e. the ratio of small hydro over all hydro capacity could be high, but the ratio of small hydro generation over total generation could be small, indicating the likely additionality of this microscale technology.

E. Assessment of Inclusion of Off Grid Electricity

21. The SSC WG also assessed the need and options for inclusion of off grid electricity generation in the definition of the term national annual electricity generation. The SSC WG is of the opinion that inclusion or exclusion of off grid electricity would have negligible impact on the outcome of the analysis. This is because if all off grid electricity generation were to be included in the national annual electricity generation (the denominator of the ratio), the off grid generation corresponding to the microscale technology should also be included in the grid-connected microscale technology generation (the numerator). It would then be necessary, to have information about these two parameters (all off grid electricity generation and off grid generation of the microscale technology), which in most countries may not be easily available. It will also be required to have a common definition of "off grid generation". In many countries off grid generation refers to plants that are not connected to the grid, but in others off grid generation is defined as electricity supplied to users connected to grids with less than 12 hours per day availability.

22. Furthermore project activities involving off-grid technologies that provide electricity to users/communities are already covered under criteria 2 (a) and (c).

Annex 1

Figure 1. **Renewable Electric capacity existing at end of 2010,**

Technology	World Total	Developing Countries	EU-27	United States	China	Germany	Spain	India
	GW							
Wind power	198	61	84	40	45	27	21	13
Biomass power	62	27	20	10	4	5	0.5	3
Solar PV	40	n/a	29	2.5	0.9	17.3	3.8	~ 0
Geothermal power	11	5	1	3.1	~ 0	0	0	0
Solar thermal power (CSP)	1.1	0	0.6	0.5	0	0	0.6	0
Ocean (tidal) power	0.3	0	0.3	0	0	0	0	0
Total renewable power capacity (not including hydropower)	312	94	135	56	50	49	26	16
Hydropower	1,010 [1]	n/a	130	78 [2]	213	5 [2]	16	40 [2]
Total renewable power capacity (including hydropower)	1,320 [1]	n/a	265	134	263	54	42	56

Source : REN21. 2011. Table R4, page 73, *Renewables 2011: Global Status Report.* Paris: REN21 Secretariat

Figure 2. **Share of Electricity from Renewables existing in 2009, and Targets,**

Country/Region	Existing Share (end 2009)	Future Target
Global[1]	18%	—
EU-27[1]	20%	→ 21% by 2010
Algeria	0.8%	→ 5% by 2017 → 20% by 2030
Argentina[3]	29%	→ 40% by 2015
Australia	7.2%	→ 20% by 2020
Bangladesh	-	→ 5% by 2015 → 10% by 2020
Brazil[2]	6.0%	→ 16% by 2020
Cape Verde	-	→ 50% by 2020
Chile[2]	6%	→ 8% by 2020
China[2]	0.8%	→ 3% by 2020
Czech Republic	6.3%	→ 16–17% by 2030
Dominican Republic[1]	10%	→ 10% by 2015 → 25% by 2020
Egypt	12%	→ 20% by 2020
Estonia	2.6% 16%	→ 8% by 2015 → 35% by 2020
Germany		→ 50% by 2030 → 65% by 2040 → 80% by 2050
Ghana	-	→ 10% by 2020
India[4]	14%	→ 10% by 2012
Israel	0.1%	→ 5% by 2016 → 7% by 2020
Italy	21%	→ 26.4% by 2020
Jamaica[1]	3.0%	→ 15% by 2020
Japan[2]	2.2%	→ 1.63% by 2014
Kuwait	-	→ 5% by 2020
Libya	0%	→ 10% by 2020 → 30% by 2030
Madagascar	64%	→ 75% by 2020
Mauritius	37%	→ 65% by 2028
Mongolia	3.0%	→ 20–25% by 2020
Morocco[5]	16%	→ 20% by 2020 → 42% by 2020
New Zealand[6]	73%	→ 90% by 2025
Nicaragua	29%	→ 38% by 2011
Nigeria[2]	~ 0%	→ 7% by 2025
Pakistan[2]	~ 0%	→ 10% by 2012
Palestinian Territories	-	→ 10% by 2020
Philippines	33%	→ 40% by 2020
Portugal	44%	→ 55–60% by 2020
Romania	27%	→ 35% in 2015 → 38% by 2020
Russia[2]	0.1%	→ 2.5% by 2015 → 4.5% by 2020
Rwanda	-	→ 90% by 2012
South Africa	1.7%	→ 4% by 2013 → 13% by 2020 → 14% by 2050
Spain	26%	→ 40% by 2020
Sri Lanka[2]	0.1%	→ 10% by 2017 → 14.1% by 2022
Thailand	8.1%	→ 10.6% by 2011 → 14.1% by 2022
Tonga	-	→ 50% by 2012
Tunisia	1.0%	→ 11% by 2016 → 25% by 2030
Turkey	20%	→ 30% by 2023
United Arab Emirates	-	→ 7% by 2020
United Kingdom	7.0%	→ 10.4% by 2010/11 → 15.4% by 2015/16
Scotland		→ 100% by 2020
Vietnam	-	→ 5% by 2020

Note: Actual percentages are rounded to nearest whole decimal for figures over 10%. The United States and Canada have de-facto state- or provincial-level targets through existing RPS policies (see Table R11), but no national targets. Some countries shown also have other types of targets (see Tables R7 and R9). See text of Policy Landscape section for more information about sub-national targets. Existing shares are indicative and are not intended to be a fully reliable reference. Share of electricity can be calculated using different methods. Reported figures often do not specify which method is used to calculate them, so the figures in this table for share of electricity are likely a mixture of the different methods and thus not directly comparable or consistent across countries. In particular, certain shares sourced from Observ'ER are different from those provided to REN21 by Bariloche Foundation (for example, Observ'ER lists the shares for Argentina and Cuba as 29% and 3%, respectively, while Bariloche Foundation lists these shares as 36% and 9%, respectively). The difference likely stems from calculations using different (and equally valid) methods.

1 Global share is for end 2008. EU-27 2009 share is preliminary (19.9% per EC Joint Research Centre, Renewable Energy Snapshots (Brussels: May 2010). Dominican Republic (DR) and Jamaica shares are estimations from Bariloche Foundation, which, in some cases, used extrapolations of the previous year's data. It appears DR met its 2015 target, but this may be due the use of different methods in setting the target or calculating share value.

2 For certain countries, existing shares exclude large hydro, because corresponding targets exclude large hydro. With large hydro included, shares for these countries are: Brazil 89%, Chile 50%, China 16%, Japan 10%, Nigeria 28%, Pakistan 31%, Russia 17%, and Sri Lanka 42%. Shares excluding hydro have been calculated from data published by Observ'ER (source below).

3 Argentina also has a target of 8% of electricity by 2016 from sources excluding large hydro.

4 India has already reached this target.

5 Morocco's second target of 42% by 2020 refers to installed capacity.

6 New Zealand's target is not mandatory and is intended as a guide for government policy.

Source : REN21. 2011. Table R8, page 79,, *Renewables 2011: Global Status Report.* Paris: REN21 Secretariat.

Figure 3. **Status of Renewable Energy Technologies: Characteristics and Costs**

Technology	Typical Characteristics		Typical Energy Costs (U.S. cents/kilowatt-hour)
Power Generation			
Large hydro	Plant size:	10 MW–18,000 MW	3–5
Small hydro	Plant size:	1–10 MW	5–12
On-shore wind	Turbine size:	1.5–3.5 MW; Rotor diameter: 60–100 meters	5–9
Off-shore wind	Turbine size:	1.5–5 MW; Rotor diameter: 70–125 meters	10–20
Biomass power	Plant size:	1–20 MW	5–12
Geothermal power	Plant size: Types:	1–100 MW; binary, single- and double-flash, natural steam	4–7
Solar PV (module)	Efficiency:	crystalline 12–19%; thin film 4–13%	–
Solar PV (concentrating)	Efficiency:	25%	–
Rooftop solar PV	Peak capacity:	2–5 kW_{peak}	17–34
Utility-scale solar PV	Peak capacity:	200 kW to 100 MW	15–30
Concentrating solar thermal power (CSP)	Plant size: Types:	50–500 MW (trough), 10–20 MW (tower) trough, tower, dish	14–18 (trough)
Rural Energy			
Mini-hydro	Plant capacity:	100–1,000 kW	5–12
Micro-hydro	Plant capacity:	1–100 kW	7–30
Pico-hydro	Plant capacity:	0.1–1 kW	20–40
Biogas digester	Digester size:	6–8 m^3	n/a
Biomass gasifier	Size:	20–5,000 kW	8–12
Small wind turbine	Turbine size	3–100 kW	15–25
Household wind turbine	Turbine size:	0.1–3 kW	15–35
Village-scale mini-grid	System size:	10–1,000 kW	25–100

Source: REN21. 2011. Table 1, page 33, *Renewables 2011: Global Status Report*. Paris: REN21 Secretariat.

Figure 4. Typical levelized cost of electricity generation by technologies (USc/kWh).

Technologies		**IPCC SRREN 2011**[1]	**IEA, WEO 2010**[2]		**REN21 2011**[3]	**Other literatures 2010-2030**
			2010-2020	2021-2035*		
Biomass (combustion)		7.9-16	13.1	12.6		
	Small				5-12	
Solar	Residential (rooftop)	23-86	40.6	21.7	17-34	
	Commercial (rooftop)	22-83	40.6	21.7		
	Utility scale	15-62	28	15.7	15-30	
	CSP	20-31	20.7	15.6	14-18	
Geothermal		4.5-17	5.2	4.6	4-7	
Hydro		2.4-15	9.4	9.5	3-5	
	Small		14.3	14.3	5-12	
Ocean (e.g., Wave, Tidal)		23-32	28.1	18.7		
Wind	On-shore	5.2-17	8.5	6.5	5-9	
	Off-shore	12-23	10.1	7.4	10-20	
Coal						8.01**
Oil						7.24**
Gas						9.21**

Note: Cost figures are based on 10% discount factor. No transmission/distribution costs are included.

* The projected values are based on "learning rate: i.e., increased deployment, which accelerates technological progress and increases the economies of scale in manufacturing the associated equipment.

[1] Bruckner, T., H. Chum, A. Jäger Waldau, Å. Killingtveit, L. Gutiérrez-Negrín, J. Nyboer, W. Musial, A. Verbruggen, R. Wiser , 2011: Annex III: Cost Table. In IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Sch lömer, C. von Stechow (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

[2] IEA. 2010. World Energy Outlook 2010. Paris: International Energy Agency,

[3] REN21. 2011. Renewables 2011: Global Status Report. REN21 Secretariat

** The costs correspond to base load fossil fuel generation technologies and are estimated by Bazilian et. Al (2010)[4] are derived from IEA(2010)[5] reflecting recent price trends of fossil fuel with an average expected oil price of USD 100/bbl from 2010-2030 based on figures from IEA (2009).[6]

Figure 5. Projected renewable energy generation costs in IEA scenarios

	Generating costs						Learning rates
	2010-2020 ($2009 per MWh)			2021-2035 ($2009 per MWh)			
	Min	Max	Avg	Min	Max	Avg	(%)
Hydro - large	51	137	94	52	136	95	1%
Hydro - small	71	247	143	70	245	143	1%
Biomass	119	148	131	112	142	126	5%
Wind - onshore	63	126	85	57	88	65	7%
Wind - offshore	78	141	101	59	94	74	9%
Geothermal	31	83	52	31	85	46	5%
Solar PV - large scale	195	527	280	99	271	157	17%
Solar PV - buildings	273	681	406	132	356	217	17%
CSP	153	320	207	107	225	156	10%
Marine	235	325	281	139	254	187	14%

Source: IEA. 2010. Table 10.1, pp 310. *World Energy Outlook 2010*. Paris: International Energy Agency.

[4] Bazilian et al, 2010, Energy poverty and development- Bridging the Energy Poverty Gap, Geopolitics of Energy, Nov 2010
[5] IEA. 2010. Projected Costs of Generating Electricity. Paris: International Energy Agency,
[6] IEA. 2009. World Energy Outlook 2009. Paris: International Energy Agency.

Figure 6. Share of Renewable electricity generation in total annual generation in 2009

		Percentage share in annual electricity generation							
	Non Annex-I Parties (Excluding LDC and SIDS)	**Fossil Fuel**	**Hydro**	**Wind**	**Biomass**	**Geotherma**	**Solar**	**Tidal/ wave/ ocean**	Total Generation (TWh)
1	Albania	0.61%	99.39%	0.00%	0.00%	0.00%	0.00%	0.00%	5.3
2	Argentina	63.19%	27.76%	0.03%	1.38%	0.00%	0.00%	0.00%	121.9
3	Armenia	20.35%	35.60%	0.07%	0.00%	0.00%	0.00%	0.00%	5.7
4	Azerbaijan	87.75%	12.24%	0.01%	0.00%	0.00%	0.00%	0.00%	18.9
5	Bolivia	61.43%	37.52%	0.00%	1.05%	0.00%	0.00%	0.00%	6.1
6	Bosnia-Herzegovina	60.18%	39.82%	0.00%	0.00%	0.00%	0.00%	0.00%	15.7
7	Brazil	8.09%	83.82%	0.27%	4.95%	0.00%	0.00%	0.00%	466.5
8	Cameroon	29.89%	69.95%	0.00%	0.16%	0.00%	0.00%	0.00%	5.7
9	China, People's Republic	80.64%	16.66%	0.73%	0.06%	0.00%	0.01%	0.00%	3695.9
10	Chile (OECD)	57.52%	34.89%	0.53%	6.90%	0.00%	0.00%	0.00%	62.5
11	Colombia	27.16%	71.68%	0.10%	1.06%	0.00%	0.00%	0.00%	57.3
12	Congo	36.05%	63.95%	0.00%	0.00%	0.00%	0.00%	0.00%	0.5
13	Costa Rica	4.85%	77.77%	3.51%	1.10%	12.77%	0.00%	0.00%	9.3
14	Côte d'Ivoire	62.03%	35.92%	0.00%	2.05%	0.00%	0.00%	0.00%	5.9
15	Ecuador	44.40%	53.53%	0.02%	2.05%	0.00%	0.00%	0.00%	17.2
16	Egypt	89.93%	9.25%	0.82%	0.00%	0.00%	0.00%	0.00%	139.0
17	El Salvador	43.66%	26.00%	0.00%	4.01%	26.33%	0.00%	0.00%	5.8
18	Gabon	46.40%	53.18%	0.00%	0.42%	0.00%	0.00%	0.00%	1.7
19	Georgia	13.39%	86.61%	0.00%	0.00%	0.00%	0.00%	0.00%	8.6
20	Ghana	23.23%	76.77%	0.00%	0.00%	0.00%	0.00%	0.00%	9.0
21	Guatemala	42.67%	23.34%	0.00%	33.99%	0.00%	0.00%	0.00%	9.0
22	Honduras	54.93%	42.51%	0.00%	2.55%	0.00%	0.00%	0.00%	6.6
23	India	83.82%	11.89%	1.99%	0.22%	0.00%	0.00%	0.00%	899.4
24	Indonesia	86.70%	7.32%	0.00%	0.00%	5.98%	0.00%	0.00%	155.5
25	Iran, Islamic republic of	96.33%	3.56%	0.11%	0.00%	0.00%	0.00%	0.00%	203.2
26	Kazakhstan	91.26%	8.74%	0.00%	0.00%	0.00%	0.00%	0.00%	78.7
27	Kenya	44.06%	31.56%	0.23%	4.67%	19.48%	0.00%	0.00%	6.9
28	Korea, Dem. People's Republic of	40.91%	59.09%	0.00%	0.00%	0.00%	0.00%	0.00%	21.1
29	Kyrgyz Republic	10.72%	89.28%	0.00%	0.00%	0.00%	0.00%	0.00%	11.1
30	Lebanon	95.48%	4.52%	0.00%	0.00%	0.00%	0.00%	0.00%	13.8
31	Malaysia	93.65%	6.35%	0.00%	0.00%	0.00%	0.00%	0.00%	105.1
32	Mexico (OECD)	80.36%	13.82%	0.15%	1.01%	2.47%	0.00%	0.00%	268.4
33	Moldova, Republic of	98.47%	1.53%	0.00%	0.00%	0.00%	0.00%	0.00%	3.6
34	Morocco	86.03%	12.14%	1.83%	0.00%	0.00%	0.00%	0.00%	21.4
35	Namibia	17.97%	82.03%	0.00%	0.00%	0.00%	0.00%	0.00%	1.7
36	Nicaragua	69.10%	8.60%	3.19%	10.51%	8.60%	0.00%	0.00%	3.5
37	Nigeria	77.10%	22.90%	0.00%	0.00%	0.00%	0.00%	0.00%	19.8
38	Pakistan	67.52%	29.45%	0.00%	0.00%	0.00%	0.00%	0.00%	95.4
39	Panama	43.63%	56.12%	0.00%	0.24%	0.00%	0.00%	0.00%	6.9
40	Paraguay	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	55.0
41	Peru	40.97%	57.62%	0.00%	1.41%	0.00%	0.00%	0.00%	35.4
42	Philippines	67.41%	15.81%	0.10%	0.00%	16.67%	0.00%	0.00%	61.9
43	Serbia	72.63%	27.37%	0.00%	0.00%	0.00%	0.00%	0.00%	37.4
44	Sri Lanka	60.29%	39.50%	0.03%	0.02%	0.00%	0.16%	0.00%	9.9
45	Syrian Arab Republic	95.69%	4.31%	0.00%	0.00%	0.00%	0.00%	0.00%	43.3
46	Tajikistan	2.03%	97.97%	0.00%	0.00%	0.00%	0.00%	0.00%	16.1
47	Thailand	91.14%	4.82%	0.00%	4.03%	0.00%	0.01%	0.00%	148.4
48	Uruguay	31.31%	59.39%	0.36%	8.94%	0.00%	0.00%	0.00%	8.9
49	Uzbekistan	81.30%	18.70%	0.00%	0.00%	0.00%	0.00%	0.00%	49.9
50	Venezuela, RB	27.21%	72.79%	0.00%	0.00%	0.00%	0.00%	0.00%	123.4
51	Vietnam	63.96%	36.04%	0.00%	0.00%	0.00%	0.00%	0.00%	83.2
52	Zimbabwe	46.66%	53.34%	0.00%	0.00%	0.00%	0.00%	0.00%	7.9

Source: IEA. 2011. *Energy balances of OECD/Non-OECD Countries.* Paris. International Energy Agency.

Note: The data reported is not distinguished by size i.e. <5MW is not reported separately. However in the case of Solar and Wind, it is likely that the each generation unit falls under the size of 5 MW.

The following countries are not included in the table because the share of electricity generation from each of the listed renewable technologies is less than 1% as compared to the total generation: Algeria, Botswana, Cyprus, Israel, Jordan, Korea Republic, Kuwait, Libya, Malta, Mongolia, Oman, Qatar, Saudi Arabia, South Africa, Tunisia, Turkmenistan, United Arab Emirates.

Figure 7. Share of installed capacity of renewable energy technologies in total installed capacity in 2009

	Non Annex-I Parties (Excluding LDC and SIDS)	Fossil Fuel	Hydro	Wind	Biomass	Geothermal	Solar	Tidal/ wave/ ocean	Total Estimated GW
1	Albania	0.37%	99.63%	0.00%	0.00%	0.00%	0.00%	0.00%	1.33
2	Algeria	98.68%	1.32%	0.00%	0.00%	0.00%	0.00%	0.00%	6.54
3	Argentina	53.40%	39.07%	0.07%	1.28%	0.00%	0.00%	0.00%	21.95
4	Armenia	17.15%	49.98%	0.16%	0.00%	0.00%	0.00%	0.00%	1.02
5	Azerbaijan	81.13%	18.84%	0.03%	0.00%	0.00%	0.00%	0.00%	3.11
6	Bolivia	49.12%	49.97%	0.00%	0.92%	0.00%	0.00%	0.00%	1.16
7	Bosnia-Herzegovina	47.57%	52.43%	0.00%	0.00%	0.00%	0.00%	0.00%	3.02
8	Brazil	5.17%	89.26%	0.45%	3.47%	0.00%	0.00%	0.00%	111.04
9	Cameroon	20.39%	79.49%	0.00%	0.12%	0.00%	0.00%	0.00%	1.28
10	China, People's Republic	71.95%	24.75%	1.71%	0.06%	0.00%	0.04%	0.00%	630.53
11	Chile (OECD)	46.09%	46.55%	1.12%	6.05%	0.00%	0.00%	0.00%	11.86
12	Colombia	18.35%	80.68%	0.18%	0.78%	0.00%	0.00%	0.00%	12.90
13	Congo	25.29%	74.71%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11
14	Costa Rica	3.08%	82.20%	5.85%	0.76%	8.10%	0.00%	0.00%	2.23
15	Côte d'Ivoire	49.99%	48.20%	0.00%	1.81%	0.00%	0.00%	0.00%	1.11
16	Ecuador	32.69%	65.62%	0.03%	1.66%	0.00%	0.00%	0.00%	3.56
17	Egypt	83.67%	14.34%	1.99%	0.00%	0.00%	0.00%	0.00%	22.74
18	El Salvador	37.10%	36.80%	0.00%	3.73%	22.37%	0.00%	0.00%	1.04
19	Gabon	34.26%	65.40%	0.00%	0.34%	0.00%	0.00%	0.00%	0.34
20	Georgia	8.50%	91.50%	0.00%	0.00%	0.00%	0.00%	0.00%	2.05
21	Ghana	15.38%	84.62%	0.00%	0.00%	0.00%	0.00%	0.00%	2.06
22	Guatemala	35.93%	32.73%	0.00%	31.34%	0.00%	0.00%	0.00%	1.63
23	Honduras	42.74%	55.09%	0.00%	2.18%	0.00%	0.00%	0.00%	1.29
24	India	75.55%	17.84%	4.72%	0.22%	0.00%	0.01%	0.00%	151.88
25	Indonesia	82.67%	11.63%	0.00%	0.00%	5.70%	0.00%	0.00%	24.82
26	Iran, Islamic republic of	93.93%	5.78%	0.29%	0.00%	0.00%	0.00%	0.00%	31.72
27	Kazakhstan	86.24%	13.76%	0.00%	0.00%	0.00%	0.00%	0.00%	12.68
28	Kenya	36.17%	43.15%	0.50%	4.20%	15.99%	0.00%	0.00%	1.27
29	Korea, Dem. People's Republic of	29.36%	70.64%	0.00%	0.00%	0.00%	0.00%	0.00%	4.47
30	Korea, Republic (OECD)	68.95%	1.31%	0.46%	0.15%	0.00%	1.10%	0.00%	71.32
31	Kyrgyz Republic	6.73%	93.27%	0.00%	0.00%	0.00%	0.00%	0.00%	2.69
32	Lebanon	92.70%	7.30%	0.00%	0.00%	0.00%	0.00%	0.00%	2.16
33	Malaysia	89.86%	10.14%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67
34	Mexico (OECD)	73.52%	21.06%	0.36%	1.01%	2.26%	0.02%	0.00%	44.66
35	Moldova, Republic of	97.48%	2.52%	0.00%	0.00%	0.00%	0.00%	0.00%	0.55
36	Morocco	77.47%	18.21%	4.32%	0.00%	0.00%	0.00%	0.00%	3.62
37	Namibia	11.62%	88.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.41
38	Nicaragua	61.75%	12.80%	7.48%	10.29%	7.69%	0.00%	0.00%	0.59
39	Nigeria	66.90%	33.10%	0.00%	0.00%	0.00%	0.00%	0.00%	3.47
40	Pakistan	56.63%	41.13%	0.00%	0.00%	0.00%	0.00%	0.00%	17.31
41	Panama	31.76%	68.04%	0.00%	0.20%	0.00%	0.00%	0.00%	1.45
42	Paraguay	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.93
43	Peru	29.59%	69.30%	0.00%	1.11%	0.00%	0.00%	0.00%	7.45
44	Philippines	60.90%	23.78%	0.25%	0.00%	15.06%	0.01%	0.00%	10.43
45	Serbia	61.44%	38.56%	0.00%	0.00%	0.00%	0.00%	0.00%	6.73
46	Sri Lanka	47.49%	51.82%	0.06%	0.02%	0.00%	0.61%	0.00%	1.91
47	Syrian Arab Republic	93.02%	6.98%	0.00%	0.00%	0.00%	0.00%	0.00%	6.78
48	Tajikistan	1.23%	98.77%	0.00%	0.00%	0.00%	0.00%	0.00%	4.05
49	Thailand	87.97%	7.74%	0.00%	4.26%	0.00%	0.03%	0.00%	23.40
50	Tunisia	97.57%	0.83%	1.60%	0.00%	0.00%	0.00%	0.00%	2.42
51	Uruguay	22.21%	70.17%	0.67%	6.95%	0.00%	0.00%	0.00%	1.90
52	Uzbekistan	72.31%	27.69%	0.00%	0.00%	0.00%	0.00%	0.00%	8.54
53	Venezuela, RB	18.33%	81.67%	0.00%	0.00%	0.00%	0.00%	0.00%	27.89
54	Vietnam	51.59%	48.41%	0.00%	0.00%	0.00%	0.00%	0.00%	15.70
55	Zimbabwe	34.44%	65.56%	0.00%	0.00%	0.00%	0.00%	0.00%	1.62

Source: Estimated based on IEA. 2011. *Energy balances of OECD/Non-OECD Countries.* Paris. International Energy Agency (see annex 2 for details).

Note: The data reported are not distinguished by sizes i.e. <5 MW is not reported separately. However in the case of Solar and Wind, it is likely that the each generation unit falls under the size of 5 MW.

The following countries are excluded from the table because the share of installed capacity of each of the listed renewable technologies is less than 1% as compared to the total installed capacity in the country: Botswana, Cyprus, Israel, Jordan, Kuwait, Libya, Malta, Mongolia, Oman, Qatar, Saudi Arabia, South Africa ,Turkmenistan and United Arab Emirates.

Annex 2: Estimation of installed capacity

Following assumptions on utilization factors of various electricity generation technologies are made in order to derive capacity (GW) figures shown in figure 7 from annual electricity generation (GWh) figures reported in IEA (2011)[7]

Technology	Load factor
Wind	29%
PV	16%
Hydro	45%
Biomass	68%
Ocean, Wave/ Tidal	25%
Fossil	75%
Geothermal	75%

Sources: Load factors for Wind, PV, Hydro and Biomass are taken from Schneider et al (2010)[8] which are based on Kalschmitt et al 2007, SSC engineers (2005), Steinmetz et al (2007, USEPA (2006), UNEP Risoe Centre (2008). The figures are consistent with the average values reported in IPCC (2011)[1]. For Ocean/Wave/Tidal and Geothermal, average from IPCC (2011) [1] are used. IEA (2010[5]) values are used for thermal generation.

[7] IEA 2011. *Energy balances of OECD/Non-OECD Countries.* Paris. International Energy Agency
[8] Schneider, M., Schmidt, T., and Hoffmann, V.H. 2010. Performance of Renewable Energy Technologies under the CDM. Climate Policy 10(1): 17-37.