Appendix 1

Additional information to the Proposed Methodology
"Installation of Run-of-river Small Hydropower Generation Plant"

It is concluded to apply the emission factor of 0.533 tCO_2/MWh for electricity displaced by a small hydropower plant in Kenya to achieve net emission reductions.

1. Background

Emission reductions are typically calculated by multiplying the amount of gird electricity displaced by the emission factor of the electricity. In order to secure net emission reductions, the emission factors of electricity generated in Kenya were studied.

2. Findings and Rationale

2.1. Standardized grid emission factors of Kenya

The National Environment Management Authority (NEMA), which is the Designated National Authority (DNA) of Kenya, published a report on the standardized grid emission factor in 2014. The emission factors presented were calculated using the "Tool to calculate the emission factor for an electricity system, Version 04.0". The lowest value presented in the report is 0.5793 tCO_2/MWh, which is the build margin calculated at that time.

2.2. Status of power sources in Kenya

Table 1 shows the electricity generation by energy source in the Kenyan national grid. Approximately 99% of the electricity generated by non- low-cost/must-run power plants was sourced from diesel in 2013 (NEMA 2014). Diesel power plants constituted approximately 93% of the effective installed capacity of non- low-cost/must-run power plants in Kenya in 2015 (KPLC 2015).

Table 1 Annual electricity generation by energy source in Kenya (GWh)

	2012/2013		2013/2014		2014/2015	
Low-Cost Must Run	**5981.9**	***(74.9%)***	**6025.6**	***(69.3%)***	**7419.7**	***(81.3%)***
Hydropower	4298.0	*(53.8%)*	3944.0	*(45.4%)*	3309.0	*(36.2%)*
Geothermal	1599.0	*(20.0%)*	2007.0	*(23.1%)*	4059.0	*(44.5%)*
Biomass	71.0	*(0.9%)*	57.0	*(0.7%)*	14.0	*(0.2%)*
Wind	13.9	*(0.2%)*	17.6	*(0.2%)*	37.7	*(0.4%)*
Other Sources	**2007.0**	***(25.1%)***	**2667.8**	***(30.7%)***	**1710.7**	***(18.7%)***
Diesel (AGO or HFO)	1980.0	*(24.8%)*	2626.8	*(30.2%)*	1706.7	*(18.7%)*
Gas (Kerosene)	27.0	*(0.3%)*	41.0	*(0.5%)*	4.0	*(0.0%)*
Total	**7988.9**	***(100.0%)***	**8693.4**	***(100.0%)***	**9130.4**	***(100.0%)***

Note: The percentage figures may not add up to 100% due to rounding.
Source: KPLC 2015

2.3. Emission factor of diesel power plants

The emission factor of the most efficient diesel power generation is found to be 0.533 tCO_2/MWh in the additional information for the approved JCM methodology PW_AM001 “Displacement of Grid and Captive Genset Electricity by a Small-scale Solar PV System”. According to that additional information, the most efficient diesel power generator in the world has a generation efficiency close to 49%. A power generation efficiency of 49% translates into an emission factor of 0.533 tCO_2/MWh. This value is lower than any of the emission factors calculated in the report on the standardized grid emission factor (NEMA 2014).

3. Conclusion

From the foregoing discussions, it can be concluded that by applying the emission factor of 0.533 tCO_2/MWh, which is smaller than the emission factor of the most efficient diesel power generator in the world, for electricity displaced by a small hydropower plant, net emission reductions are achieved.

References

NEMA 2014, Grid Emission Factor, Republic of Kenya, Report on the Determination of the Standardised Baseline

KPLC 2015, Annual Report and Financial Statements