Datum
2017-11-20

Diarienr
2017-6654

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The Power Africa Beyond the Grid Fund for Zambia:

Methodology to measure, report and verify on annually avoided greenhouse gas emissions

Version 1.2 (Amended/Corrected 28.05.2020)

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Introduction

Beyond the Grid Fund for Zambia (BGFZ) is a Sida-funded initiative for renewable energy investments outside the national power grid in Zambia. BGFZ aims to speed-up market access and market development, promoting the development of energy services targeted to poor consumers who already spend a high proportion of their disposable income on substandard forms of energy.

Part of Sweden's contribution to the Power Africa initiative BGFZ employs a new and innovative model for large-scale public procurement of development results (Social Impact Procurement) which aims to increase transparency and ensure cost-effectiveness of the Swedish contribution and develop the market for renewable energy in Zambia. BGFZ will launch several competitive tender processes targeting national and international Energy Service Providers (ESPs). Each such call specifies a set of development results that are procured by ESPs. It may be a matter of a certain number of connections by households, companies and institutions to renewable electricity generation or a specified benefit (e.g. lighting, heating, cooling, jobs or reduced emissions). Simply put, the BGFZ "buys" pre-specified development results in a market.

In February 2016, the Embassy of Sweden in Lusaka contracted the Renewable Energy and Energy Efficiency Partnership (REEEP) to assist the Embassy with developing and administering BGFZ. The project includes market analysis, procurement, tender evaluation, review and monitoring of the contracts with ESPs. In June 2016, the first procurement round of the BGFZ was launched with a maximum total contract value of 150 MSEK. A decision to award contracts was taken by Sida in December 2016.

Monitoring and reporting on avoided GHG emissions

The Swedish Energy Agency has been assigned to propose methodologies for calculating CO_2 emission reductions for the BGFZ including related information and reporting requirements that should apply to the ESPs. The assignment also includes outlining the envisaged roles of the key stakeholders.

This report outlines likely baseline scenarios and monitoring options for micro-grid, solar lamp and clean cook stove technologies in Zambia. The analysis presented draws upon a range of existing peer-reviewed scientific and other specialized literature as well as Clean Development Mechanism (CDM) methodologies. Throughout the analysis, baseline scenarios are suggested based on common practice and an assessment of potential accuracy. Considerations are presented in order to evaluate options for project monitoring and verification.

Conditions specific to Zambia have been applied to the estimates of potential emissions reductions where possible.

Scope

The assignment should include;

- recommendations regarding the scope to be applied in measuring and reporting avoided CO_2e emissions in the BGFZ;

- identification, analysis and recommendations regarding methodologies for calculating, measuring, reporting and verifying avoided CO_2e emissions to be applied by ESPs in BGFZ

-identification of parameters to be included in contracts between ESPs and the Embassy of Sweden in Lusaka;

- analysis and recommendations for roles and responsibilties of stakeholders (i.e. ESPs, BGFZ Agent, External verification agent, Sida/Embassy of Sweden in Lusaka, the Government of Zambia) in measuring and reporting avoided CO_2e emissions reduction in the context of the BGFZ.

- analysis of opportunities that measuring, reporting and verifying avoided CO_2e emissions can bring.

Evaluating emissions scenarios and reporting and monitoring requirements for micro-grid, solar home systems and clean cook stove technologies in Zambia

General

Emission reductions can be calculated as the difference between baseline emissions of those services displaced by the BGFZ investments and emissions associated with the BGFZ investments.

In the case of the BGCF all services provided are based on renewable energy technologies and fuels and project emissions are therefore regarded to be zero.

Hence, this section identifies an approach to estimate the emission of existing sources of energy that the Fund's investments will displace.

An important prerequisite when analyzing emission scenarios and methods to calculate emission reductions is that the target group of the BGFZ are off-grid customers without reliable access to modern energy supply.

Within this target group it is sometimes necessary to distinguish between customers in rural and peri-urban areas.

Tier H1-H3

Approximately 2% of households in rural areas in Zambia have grid access. Customers living in peri-urban areas (called “compounds”) albeit geographically closer to city centres are generally excluded from services such as water, sewer and grid electricity. [1]

Common energy consuming activities of such households are

- Lighting, primarily by paraffin candles and kerosene lamps,
- mobile phone charging and using a radio running on disposable dry cell batteries.
- cooking (using wood or charcoal)

Approaches to estimating baseline emissions for the above categories are outlined below:

<u>Lighting</u>

Baseline fuel-based technology:

79% of off-grid households in Zambia use paraffin candles and 14% use kerosene lamps. Behaviour between the two groups has been compared and no significant differences were identified. [1]

Emission rates: Emissions associated with paraffin candles have been reported in scientific peer review literature to be about 5,5 g CO_2/h and the emissions associated with portable kerosene lamps to be 14,9 g CO_2/h [2].

On this basis, the below emission factor for lighting is proposed (approximate weighted average):

Emission factor lighting = 0,8x0,006 + 0,2x0,015 = 0,008 kg CO_2/h. (corrected 28.05.2020)

Utilisation: Several independent studies indicate that average nightly usage of candles and lighting is approximately 3 hours [1]. Having multiple either candles or kerosene lamps lit simultaneously is reported to be common, while carrying lamps or candles from room to room is less common. Furthermore, it is reasonable to assume that baseline lighting sources are utilised 365 days per year.

Thus the average annual emission for one light source is estimated to be:

Average annual emissions per baseline light source = 365 (d/a) x 3 (h/d) x 0,008 kg CO_2/h = 8,8 kg CO_2/a.

Furthermore, a leakage factor needs so be taken into account: In practice users continue using existing fuel-based light sources even after introduction of a solar home system [2]. The existing fuel-based light sources may be moved to a different location or used in conjunction with the newly introduced LED light. Following the logic that the more LED light sources introduced, the less likely it is that existing light sources continue being used, the following substitution factors are proposed; 50% for Tier H1, 75% for Tier H2 and 100% for Tier H3.

Adjusted for leakage the annual baseline emissions avoided per LED light source would thus be: T H1=4,4; T H2=6,6; T H3=8,8 kg CO_2/a.

Mobile charging

Capacity and energy requirement: A typical mobile phone charger is rated at anywhere between 3-7 W while charging. Charging two hours/day will consume 0.006 to 0.014 kWh of electricity. Here, the mid-range value 0,01 kWh is applied.

If the mobile phone is kept on charge even after it is fully charged, it still requires about 2-4 W. [3] However, it can be argued that this is effect has negligible impact on baseline emissions as off-grid households will charge their mobile phones at vendors, where the phone is not likely to be kept on charge after it is fully charged. Accordingly, the assumed daily electricity consumption for charging one mobile phone remains 0,01 kWh.

Utilisation: According to surveys access to solar home systems roughly double the utilisation of mobile phones [2]. Assuming that customers with access to a solar home system will charge their phones daily, the baseline charging will thus be once every other day.

Emission factor: Mobile charging vendors may use grid electricity or solar panels. For grid electricity we assume the grid emission factor (operating margin) for the Southern African Power Pool 0,99 tCO_2/MWh [4]. Due to lack of reliable data regarding the power supply of charging vendors a conservative 50/50 weighted average of grid electricity (0,99 tCO_2/kWh) and PV (0 tCO_2/kWh) is assumed; 0,5 tCO_2/MWh = 0,5 $kgCO_2$/kWh.

Thus, the annual emission for charging one mobile phone becomes: 0,01 (kWh/d) x 182 (d/a) x 0,5 (kg/KWh) = 1 kg CO_2/a.

Radio

Surveys show that the average household energy expenditure for radio in East African countries is slightly above the expenditure for charging mobile phones [2]. For simplicity, the same annual baseline emissions as for mobile charging are assumed, i.e. 1 kg CO_2/a.

Other appliances

The use of TVs in off-grid households is generally reported to be low. A survey from Uganda shows that only 4% of households without access to solar home systems watch TV regularly.

Baseline emissions for other appliances are therefore assumed to be 0 (zero).

Cooking

The Improved Cookstoves (ICS) provided will be paired with monthly pellet “subscriptions”. The pellets sold are to be 100% based on renewable biomass, hence with zero net CO_2 emissions. CO_2 emission reductions due to the displacement of non-renewable biomass will therefore be proportional to the amount of renewable pellets sold and can be calculated as is shown below.

The cooking fuel used by rural households and peri-urban households is assumed to be wood fuel and charcoal, respectively.

Default parameters provided in the CDM methodology AMS-II.G [5] assume that the 3-stone fire has a thermal efficiency of 10-20%. Stove efficiencies are determined using standardised tests such as the kitchen performance test[1], water boiling test[2] or controlled cooking test[3]. Jetter and Kariher show that the thermal efficiency for the 3-stone fire may be as high as 25% [6]. In a previous study, the thermal efficiency of cooking over an open fire was estimated to be 14.8 ± 1.8% [7]. Given the differences in thermal efficiency reported compared with those commonly applied, default values are likely to be within an acceptable range. Environmental conditions may also have an impact upon the reported thermal efficiencies.

The CDM methodology AMS-II.G [5] allows for a default thermal efficiency of 20% to be applied to ‘other stove types. A study in Ghana [8] found that the average thermal efficiency of three popular charcoal fired stoves was 25.2%, 23.4% and 29.8%, respectively.

A study for Zambia could be conducted in order to determine appropriate baseline efficiency of 3-stone fires and charcoal stoves; however, this is likely to be time intensive and costly. It is recommended that the thermal efficiency of the 3-stone fire be set to 15% and the thermal efficiency of charcoal stoves be set to 20%.

Four cases can be distinguished:

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[1] https://cleancookstoves.org/binary-data/DOCUMENT/file/000/000/83-1.pdf
[2] https://cleancookstoves.org/binary-data/DOCUMENT/file/000/000/399-1.pdf
[3] https://cleancookstoves.org/binary-data/DOCUMENT/file/000/000/80-1.pdf

- Rural household; natural draft ICS.
  Baseline cooking technology: wood-fired three stone fire of 15% thermal efficiency. [ICS thermal efficiency not specified.]
- Rural household; forced draft ICS.
  Baseline fuel: wood-fired three stone fire of 15% thermal efficiency. ICS thermal efficiency 52%.
- Peri-urban household; natural draft ICS.
  Baseline cooking technology: charcoal, conventional charcoal stove of 20% thermal efficiency. [ICS thermal efficiency not specified.]
- Peri-urban household; forced draft ICS.
  Baseline cooking technology: charcoal, conventional charcoal stove of 20% thermal efficiency. ICS thermal efficiency 52%.

Other relevant data: Pellet energy value = 4,8 kWh/kg; fraction of non-renewable biomass Zambia = 81% [6], Biomass to charcoal energy conversion factor 6:1 [5]; CO_2 emissions from wood fuel combustion = 0,39 kg CO_2/kWh biomass [7].

Based on the parameters above, the use of 1 kg pellets leads to the following CO_2 emission reduction caused by displacement of non-renewable biomass:

Rural household; natural draft ICS: 3,0 kg CO_2/kg pellets used (30% thermal efficiency of ICS assumed until specification has been received from ESP)

Rural household; forced draft ICS: 5,3 kg CO_2/kg pellets used

Urban household; natural draft: 13.6 kg CO_2/kg pellets used (30% thermal efficiency of ICS assumed until specification has been received from ESP)

Urban household; forced draft: 23,7 kg CO_2/kg pellets used

Basis for calculating annual emission reductions for Tier H1-H3:

Reporting requirements Tier H1-H3
Accumulated number of solar home systems sold; TH1, TH2, TH3
Number of household connections to micro grid; TH1, TH2, TH3
Number of customers in default; TH1, TH2, TH3
Number of solar home systems that have passed their anticipated lifetime; TH1 TH2, TH3
Tonnes of renewable pellets sold annually to each of the four categories 1. Rural household; natural draft ICS 2. Rural household; forced draft ICS 3. Peri-urban household; natural draft ICS 4. Peri-urban household; forced draft ICS

Emission reductions solar home systems and micro grid connections

Number of active solar home systems and micro grid connections for each Tier =

(Number of solar home systems sold) + (Number of micro grid connections) – (Number of SHS that have passed their anticipated lifetime) – (Number of customers in default)

Annual emission reduction Tier H1 =

Number of active TH1 solar home systems and micro grid connections x (2x4,4 + 1x1) $kgCO_2/a$ =

(Number of active TH1 solar home systems and micro grid connections x 6,5)/1000 tonnes CO_2/a.

Annual emission reduction Tier H2 =

Number of active TH2 solar home systems and micro grid connections x (3x6,6 + 1x1 + 1x1) $kgCO_2/a$ =

(Number of active TH2 solar home systems and micro grid connections x 14,3)/1000 tonnes CO_2/a.

Annual emission reduction Tier H3 =

Number of active TH3 solar home systems and micro grid connections x (5 x 8,8 + 1 x 1 + 1x1) kg CO2/a =

(Number of active TH3 solar home systems and micro grid connections x 29,5)/1000 tonnes CO_2/a.

Emission reductions ICS

Annual emission reductions ICS (tonnes CO_2/a) =

Tonnes of pellets Rural household (natural draft ICS)[4] x 3,0 +

Tonnes of pellets Rural household (forced draft ICS) x 5,3 +

Tonnes of pellets Peri-urban household (natural draft ICS) x 13,6 +

Tonnes of pellets Peri-urban household (forced draft ICS) x 23,7

We recommend that the ESP shall be requested to provide a sustainable forest management plan approved by local authorities or an independent, third-party study which substantiates that the level of carbon stocks of the managed forests or existing plantations does not systematically decrease over time.

We also recommend that the ESP shall be requested to provide reports showing test results that substantiate the thermal efficiencies of the two ICS models to be included in the programme.

[4] 30% thermal efficiency assumed for natural draft ICS until further specification has been received.

Tiers P1-P4

Tiers P1-P3

Tier P1, P2 and P3 can be treated as H1, H2 and H3, respectively. Note that it is only the section “Emission reductions solar home systems and micro grid connections” that is relevant since improved cook stoves are not offered to the P1-3 tiers.

Tier P4

Due to the step-change from Tier P3 to P4 in installed capacity and daily electric energy production capacity a different approach for the determination of baseline emissions is used for Tier P4. Tier P4 customers are considered more likely to consume baseline electricity beyond the level of electricity consumption assumed for the household Tiers H1-H3. The grid emission factor from the Southern African power pool (SAPP) is considered unlikely to be applicable in the vast majority of cases since the BGFZ specifications prioritise off-grid locations in rural and peri-urban regions.

The Zambian national utility ZESCO currently operates several mini-grids powered by diesel generators, with a total capacity of approximately 8 MW [11]. Diesel generators are therefore considered to represent the baseline power supply for the purpose of this assessment. A default emissions factor of 0.8 $kgCO_2/kWh_{electric}$ is prescribed by the CDM methodology AMS-I.F. The emission factor is considered conservative and is applied here.

It is advised to deduct some days to adjust for days when SHS is not used for productive purposes. Therefore, to make the calculated emission reductions more accurate, the number of days the SHS will be in full operation can be considered as 265 per year.

Tier P5-P6

Tiers P5 and P6 are not included in any of the ESP’s business plans and are, therefore, not considered in this report.

Basis for calculating annual emission reductions for Tier P1-P4:

Reporting requirements Tier P1-P4
Accumulated number of solar home systems sold; TP1, TP2, TP3, TP4
Number of household connections to micro grid; TP2, TP3, TP4
Number of customers in default; TP1, TP2, TP3, TP4
Number of solar home systems that have passed their anticipated lifetime; TP1, TP2, TP3, TP4

Emission reductions solar home systems and micro grid connections

Number of active solar home systems and micro grid connections for each Tier =

(Number of solar home systems sold) + (Number of micro grid connections) – (Number of SHS that have passed their anticipated lifetime) – (Number of customers in default)

Annual emission reduction Tier P1 =

Number of active TP1 solar home systems x (2x4,4 + 1x1) kgCO_2/a =

(Number of active TP1 solar home systems x 6,5)/1000 tonnes CO_2/a.

Annual emission reduction Tier P2 =

Number of active TP2 solar home systems and micro grid connections x (3x6,6 + 1x1 + 1x1) kgCO_2/a =

(Number of active TP2 solar home systems and micro grid connections x 14,3)/1000 tonnes CO_2/a.

Annual emission reduction Tier P3 =

Number of active TP3 solar home systems and micro grid connections x (5 x 8,8 + 1 x 1 + 1x1) kg CO2/a =

(Number of active TP3 solar home systems and micro grid connections x 29,5)/1000 tonnes CO_2/a.

Annual emission reductions Tier P4 =

Number of active TP4 solar home systems and micro grid connections x (0,55 kWh/d x 265 d/a x 0,8 kgCO_2/kWh) =

(Number of active TP4 solar home systems and micro grid connections x 117)/1000 tonnes CO_2/a.

Tiers I1-I2

No applicable baseline emission data based on empirical findings for customers in the I1 and I2 categories have been identified in literature.

Option 1

As the number of projected customers is low for Tiers I1 and I2 it is proposed that the ESP is tasked to collect baseline data for each customer in terms of annual fuel consumption for baseline stand alone power production and/or grid electricity consumption[5].

Emission reductions would then be calculated on the basis of collected historic fuel/electricity consumption data, fuel emission factors and/or relevant grid emission factors.

Option 2

Alternatively, Default Minimum Service Level (MSL) energy consumption value in kWh for selected consumer groups per day used in a Gold Standard methodology could be used. It recommends baseline energy service levels for different user groups (e.g. schools, health centres).

Default Minimum Service Level for electricity consumption (kWh) for each eligible consumer group[6]

Consumer Group	**Default Minimum Service Level (MSL) energy consumption value in kWh for consumer group per day**
Trading place	11.0 kWh/day
School	10.0 kWh/day
Kindergarten	4.4 kWh/day
Public administration building	4.4 kWh/day

[5] This is expected to be low since BGFZ targets off-grid areas.
[6] Gold Standard. May 2013. The Gold Standard suppressed demand methodology: Micro-scale electrification and energisation.

Small medical clinic	4.1 kWh/day

The amount of energy (and associated carbon) offset may not exceed this threshold under the Gold Standard methodology.

Emission reductions would then be calculated based on default energy consumption levels and the default emission factor for diesel gensets. A default emissions factor of 0.8 $kgCO_2/kWh_{electric}$ as prescribed by the CDM methodology AMS-I could be applied.

Note that applying these default energy consumption values would likely overestimate baseline emissions and, hence, the resulting emission reductions.

Basis for calculating annual emission reductions for Tier P1-P4:

Reporting requirements Tier I1-I2
Option 1 (recommended)
Baseline energy consumption for each respective I1 and I2 connection: Average annual diesel consumption for stand-alone power production, last 3 years Average annual grid electricity consumption (kWh), last 3 years
Option 2
Number of connections per consumer group in table (Gold Standard methodology)

Emission reductions

Option 1:

Total annual emission reduction (kg/a) =

Total annual baseline diesel consumption (litres) for all I1 and I2 connections x 2,7 kg CO_2/litre[7] +

Total annual baseline electricity consumption (kWh) for all I1 and I2 connections x 0,99 kg CO_2/kWh.

Option 2:

The total annual electricity requirement for all I1 and I2 connections is calculated based on the Gold Standard default Minimum Service Level for electricity consumption (kWh) for each eligible consumer group.

Emission reductions would then be calculated by multiplying total annual electricity requirement for all I1 and I2 by the default emissions factor of 0.8 $kgCO_2/kWh_{electric}$.

Option 1 is preferred for reasons of accuracy.

[7] Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

MRV System Design and roles and responsibilities of stakeholders

All parameters necessary to calculate the emission reductions resulting from BGFZ operations can be generated using information collected during sales, installation and operation.

Operationality status

In the case of micro grid systems Energy Service Providers (ESPs) will monitor electricity generation and consumption for billing purposes.

Operationality status of SHS can be done in any of the followings ways as prescribed by the CDM methodology AMS-I-A - "An annual check of all systems or a sample thereof to ensure that they are still operating (other evidence of continuing operation, such as on-going rental/lease payments could be a substitute)".[8]

Annual check of all system to check the operational status of SHS is both time- and cost-intensive, therefore not recommended. In comparison, annual check of sample SHS could be relatively less time consuming, however, there will be a cost and time attached to it.

The most time and cost effective approach for tracking the operationality of the SHS under BGZF projects would be to obtain relevant operational evidences from the Energy Service Providers (ESPs) such as record of loan/payment that customer have made (e.g. customer that defaulted on payment will be excluded from emissions reduction calculation).

It is assumed that the project developers of ESPs will keep a record of the end users in a database that tracks the payment made by the households and households that no longer opt to receive the service. This monitoring method is in line with the CDM methodology AMS I – A and it is both cost and time efficient, hence recommended for BGZF SHS monitoring.

For improved cook stoves the only operational parameter required is the quantity of pellets sold to each of the four defined customer groups.

Recommended sampling approach

No sampling approach is required provided that either metering data or other evidence of continuing operation, such as on-going rental/lease payments for SHS can be obtained from project developers or ESPs.

Verification

Verification that annual emission reduction calculations are consistent with the propoposed model may be performed by an independent third party reviewer or,

[8] AMS –I-A Electricity generation by the user

depending on the desired level of rigor, a first-party (self-verification) or second-party (an internal ‘arms-length’ review) could be opted for.

Benefits of measuring, reporting and verifying avoided CO_2e emissions

Benefits of implementing a robust and transparent MRV system

Consistent and credible tracking and reporting of avoided CO_2e emissions is envisaged to have several benefits. Systems that govern measurement, reporting, and verification (MRV) help quantify benefits and impacts and play a key role in determining to what degree the strategies and actions to reach sustainable, low emission development are successful.

A properly designed and implemented MRV system adds transparency to mitigation efforts and is an important management tool. These systems can inform governments, potential investors etc regarding the effectiveness of mitigation policies or programmes.

Understanding the climate impact of Sida support

As a first (and obvious) point MRV provides Sida with information needed to make objective decisions and serves as a basis to understand the efficiency of its contribution to international climate finance (mitigation impact of support in terms of CO_2e and cost-efficiency) as well as feedback to improve mitigation decision-making and strategies.

UNFCCC reporting requirements

One of the main elements of the Paris Agreement on climate change is the “enhanced transparency framework for action and support”, set out in Article 13.9 The detailed modalities, procedures and guidelines for the enhanced transparency framework remain to be developed. Hence, the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) will adopt modalities, procedures and guidelines for this framework.[10] The framework will consist of a part on action and a different part on support. Below it is discussed how MRV systems may be supportive of complying with requirements under the transparency framework.

The transparency framework for mitigation

The purpose of the transparency framework for mitigation includes providing “clarity and tracking of progress towards achieving Parties’ individual NDCs”.[11] Parties have agreed to develop guidance on features of NDCs and accounting for NDCs, as well as information needed to facilitate clarity, transparency and

[9] Transparency in the context of the international climate change negotiations generally refers to the measurement and reporting of information relating to mitigation, adaptation, finance, technology and capacity building, together with processes for the subsequent review and consideration of some of this information.
[10] Article 13.3.
[11] Article 13.5.

understanding of NDCs and track progress in implementation. The Paris Agreement states that all Parties shall pursue domestic mitigation measures to meet their NDCs, and that methodological consistency is needed between the communication and implementation of NDCs.

According to its INDC[12], Zambia intends to reduce its CO_2e emissions by implementing three programmes driven by the country's Climate Response Strategy and supported by national development policies (Sustainable Forest Management, Sustainable Agriculture, and Renewable Energy and Energy Efficiency). The Sustainable Forest Management programme encompasses measures described as "Improved cooking devices to include improved biomass stoves, use of ethanol and LPG stoves, and switch to electric stoves" with the objective "To promote natural regeneration, afforestation/ reforestation, sustainable charcoal production and utilization practices, and generation of electricity from forest waste and residues. The Renewable Energy and Energy Efficiency programme encompasses measures described as "Off grid RE to non-electrified rural – P.V and Wind" with the objective of "….switching from conventional and traditional energy sources to sustainable and renewable energy sources and practices, and use of off grid renewable energy technologies for rural electrification as decentralized systems." For both programmes "Reduced GHG emissions" is listed as a co-benefit.

It remains unclear what information is to be reported on domestic mitigation measures and what "methodological consistency" means in practice [12]. However, the sort of investments done under the BGFZ are clearly part of the "domestic mitigation measures" listed in Zambia's INDC. It is furthermore clear that the MRV framework proposed in this report would enhance the capacity of Zambia to comply with any future reporting requirements including on the impact of measures.

Building confidence to attract private capital

Institutional investors, including commercial banks, insurance companies and pension funds, are increasingly more interested in understanding the impact their funds have on GHG emissions. This interest is motivated by the need to manage exposure to regulatory and market risk, but can also stem from investor demand for thematic, green asset classes, such as access to energy or energy efficiency.

Willingness to participate in green investment opportunities, however, often fails to materialise into active investments. One reason for this is the lack of transparent and credible quantification of GHG mitigation results of green investments. Robust reporting of GHG mitigation results that meet expectations of private sector financiers may therefore decrease the knowledge gap relating to the link between invested capital and GHG mitigation impact and potentially attract private capital.

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Annex 1: Energy Service Provider (ESP) data overview

Vitalite

Products offered in Tiers H1-H3.

Tier	Total by 2020
H	
H1	74 000
H2	17 000
H3	3 000

Emerging cooking solutions

Products offered in Tiers H1-H3.

Tier	Total by 2020
H	
H1	9 000
H2	34 000
H3	2 000

d.light

Products offered in H1-H2; P1-P2

Tier	Total by 2020
H	
H1	90 000
H2	90 000
P	
P1	10 000
P2	10 000

Fenix International

Products offered in H1-H2, P1-P2

Tier	Total by 2020
H	
H1	93 000
H2	48 000
P	
P1	900
P2	500

Standard Microgrid

Products offered in H1-H3, P2-P4, I1-I2

Tier	Total by 2020
H	
H1	8000
H2	7000
H3	4000
P	
P2	800
P3	1400
P4	1200
I	
I1	150
I2	300