



Monitoring report form for CDM programme of activities
(Version 02.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT

Title of the PoA	MicroEnergy Credits - Microfinance for Clean Energy Product Lines - Mongolia	
UNFCCC reference number of the PoA	8142	
Version numbers of the PoA-DD applicable to this monitoring report	2.2	
Version number of this monitoring report	3	
Completion date of this monitoring report	22/08/2017	
Monitoring period number	3	
Duration of this monitoring period	Duration: 01/05/2016 - 30/04/2017 (Both Days Included)	
Monitoring report number for this monitoring period	1	
Coordinating/managing entity	MicroEnergy Credits	
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Mongolia	Yes
Sectoral scopes	3: Energy demand	
Applied methodologies and standardized baselines	Applied Methodology: AMS-II.E. - Energy efficiency and fuel switching measures for buildings, version 10 Applied Standardized baselines: N/A	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	N/A	46,045 tCO ₂ e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring	50,133 tCO ₂ e	

period in the CPA-DDs for the CPAs covered in this monitoring report	
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PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

>> The PoA involves the installation and maintenance of clean energy products (CEPs) including efficient cooking and heating stoves and home insulation products by Partner Organization (PO) in Mongolia.

The current practice in Mongolia is to use inefficient stoves for cooking and heating and inefficient home insulation at the household level, resulting in necessary combustion of large amounts of coal, the primary fuel used for heating. The use of this fuel generates several greenhouse gases (GHG) including Carbon dioxide (CO₂). The replacement of these traditional products with CEPs reduces the amount of fuel required for heating and reduces the amount of GHGs emitted into the atmosphere during combustion.

MicroEnergy Credits (MEC) is the CME for the PoA. MEC is a social enterprise that helps micro-entrepreneurs and low-income households in developing countries to invest in CEPs through their local microfinance institution. Under the PoA, MEC develops programs with microfinance institutions¹ and clean product suppliers to market, distribute, and finance CEPs to micro-entrepreneurs and low-income households.

Policy/measure or stated goal of the PoA

The goal of the PoA is to use microfinance to expand access to clean energy to millions of microentrepreneurs and low income households, enabling:

- Households to achieve critical development improvements (health, education, economic status)
- Households to benefit from savings on energy expenditures
- Expansion of the clean energy product supply chain to serve low income populations
- Reduced environmental impacts from carbon emissions and deforestation

A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Title: MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Mongolia –CPA No.XX “Name of CPA implementer or Partner Organization” Version Number: 2.2 dated 10/10/2012	2.2	3: Energy demand	AMS-II.E.: Energy efficiency and fuel switching measures for buildings - Version 10.0 ²

¹ For the purposes of this document, a “microfinance institution” is defined as a local institution that provides financial services to low income households.

² <http://cdm.unfccc.int/methodologies/DB/9QDGY435JDVTB8HN3VMI61K9XBWY30>

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring report? (yes/no)
8142-0001 MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Mongolia –CPA No.001:XacBank LLC	Title: MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Mongolia –CPA No.XX “Name of CPA implementer or Partner Organization”	Version Number: 2.2 dated 10/10/2012	01/08/2013 – 31/07/2020 (Renewable)	Yes
8142-0002 MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Mongolia – CPA No.002: XacBank LLC	Title: MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Mongolia –CPA No.XX “Name of CPA implementer or Partner Organization”	Version Number: 2.2 dated 10/10/2012	08/03/2016 – 07/03/2023 (Renewable)	No
8142-0003 MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Mongolia –CPA No.003: XacBank LLC	Title: MicroEnergy Credits – Microfinance for Clean Energy Product Lines - Mongolia –CPA No.XX “Name of CPA implementer or Partner Organization”	Version Number: 2.2 dated 10/10/2012	08/03/2016 – 07/03/2023 (Renewable)	No

A.2. Coordinating/managing entity

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Microenergy Credits is the CME

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SECTION B. Implementation of PoA**B.1. Description of implemented PoA**

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Three CPAs have been included so far under this PoA. The current monitoring report covers CPA-1 only. The management system validated in the PoA has been implemented in line with the provisions on the implementation of the management system in the Project Standard.

The CME has helped PO's establish a marketing and lending program for CEPs. This program engages its own staff, as well as local distributors, technicians and other service providers to effectively market the Clean Energy Products (CEPs) to clients (households). The PO's followed the

monitoring plan and procedures to identify each CEP sold during the project so that the appropriate amount of emissions reductions can be claimed.

MEC is the CME responsible for carrying out process of inclusion of CPAs in the PoA. Within MEC, the person responsible for carrying out this process is the Carbon Operations Manager. This individual is trained using the MEC user manual, which specifies how to complete the inclusion process. This individual has sufficient experience with CDM projects and terminology to successfully carry out the duties. The CME has ensured that Carbon Operations Manager received relevant training and has all necessary competencies to accurately assess and oversee the inclusion process, including the following:

- Sound understanding of all inclusion criteria
- Knowledgeable on issues relating to Additionality
- Adept at ensuring protocol are followed to prevent double counting

The Carbon Operations Manager reports to the CEO of MEC. As necessary, the Carbon Operations

Manager will contract expert assistance from a carbon consulting group to complete the inclusion process. If the Carbon Operations Manager leaves or takes on a new role, the incoming Manager will be similarly trained. The Carbon Operations Manager, the CME and the POs all respond to annual audits and address any issues found during those audits to ensure that the PoA continues to improve overtime.

MEC's Tracker Platform enables MicroEnergy Credits to maintain consistent data on all CPAs and product installations. Credit Tracker Platform is used to maintain records for each SSC-CPA. The MEC Credit Tracker Platform has been designed specifically for accelerating microfinance access to clean and efficient energy. The Credit Tracker Platform is used to collect and store the information related to the unique identification number, location, installation date, and usage status of each clean energy product (CEP) in each CPA, making it easy to identify, locate and verify any or all of the installations that pertain to a given CPA. The MEC Credit Tracker Platform is a hosted internet service, limiting the risk of loss of data.

The process for entering data into the Credit Tracker Platform is consistent across all CPAs. At the time of installation, the PO creates a Booking Record (in paper or electronic format) that captures detailed data on the installation:

- Household name
- Location of household (address and/or GPS location)
- Product type installed
- Product model installed
- Date of installation
- Unique identifier number for CEP
- Respective CPA

Once the installation is complete, the PO ensures that all the data from the Booking Record created at the time of installation is accurately captured in the electronic Booking Record in the Credit Tracker Platform.

The PO implements an internal check to verify the accuracy of data entry and to ensure that the data captured in Credit Tracker is identical to the data recorded at the time of installation. Personnel are trained in a group training session where the monitoring presentation is given by staff of the clean energy product unit. Personnel are also provided with a user manual. These training sessions take place at least once before the sale of the first CEP, and as needed according to the progress of the sales, or at least every month--whichever occurs earlier. The CME will provide the DOE with the materials generated from the meetings and trainings with all parties to demonstrate that they were conducted. The materials could be any of the following, but are not limited to, photos, emails, participation sheets, self-statements and training materials.

During the current monitoring period, no new CEP (Clean Energy Products) were distributed under this CPA.

B.2. Post-registration changes to PoA**B.2.1. Corrections**

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N/A

B.2.2. Inclusion of monitoring plan

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N/A

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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N/A

B.2.4. Changes to programme design

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N/A

PART II Monitoring of CPAs

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SECTION C. Implementation of CPAs**C.1. Description of implemented CPAs**

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XacBank LLC is the PO for CPA No. 8142-0001. XacBank is a leading microfinance institution in Mongolia, which in partnership with MEC developed a clean energy lending program to offer the CEPs included in the PoA. XacBank has signed the standard contractual agreement with the CME (MEC) to participate in the PoA, which guides the transfer of the emission reduction rights to the CME (MEC).

CPA Reference Number: 8142 – 0001

Purpose of the specific-case CPA(s) and the measures taken for GHG emission reductions or net GHG removals by sinks –

Purpose: Under the CPA, MicroEnergy Credits works with PO – XacBank to develop a successful and diversified clean energy lending program. The clean energy program addresses typical barriers for low income clients including education, price, finance, and supply and aftersales service. MicroEnergy Credits trains the PO's to implement the clean energy lending program, as well as a robust and transparent carbon credit monitoring and tracking system to quantify and record the volume of carbon emission reductions created through the clean energy program.

Measures taken: The proposed specific-case CPA involves marketing, distributing, and financing improved cooking and heating stoves and insulation products for low income households in Mongolia. These products provide efficient energy for heating and cooking .

1. Brief description of the installed technology and equipment

The project activity makes available two types of CEPs to low-income populations in Mongolia:

1. Energy efficiency: Efficient cooking and heating technologies

2. Insulation products: Ger blankets

1. Energy efficiency: Efficient cooking and heating stoves (Stove)

The efficient cooking and heating stove models under this CPA are:

- Silver Stove Mini (model 131)
- Silver Stove Turbo (model 126)
- Royal Stove Dul model (Royal Single model)
- Royal Stove Golomt model (Royal Double model)

The efficient cooking and heating stoves reduce the amount of fuel required to keep the house at a habitable temperature during cold weather. The stoves use an insulated combustion chamber and are designed to retain heat for longer and at a higher temperature than the traditional versions, allowing users to keep their homes warmer while using less fuel. All stoves employed in the CPA utilize the most common and locally accessible fuel sources—primarily pit-coal along with a minority use of wood (primarily non-renewable biomass) as a starter fuel—while significantly enhancing the combustion process. The PoA includes emissions reductions from decreased use of coal only; to be conservative it does not include emissions reductions from decreased consumption of non-renewable biomass used as starter fuel.

As all of the efficient cooking and heating stoves are similar in design and have thermal efficiency specifications within +/-5% of each other³, they are considered as a single technology type of “stove” in crediting.

Stoves are installed in one of two dwelling types: a house or a Ger. A ger (i.e. a yurt) is a portable felt-covered dwelling structure that is the traditional housing type and is a low-cost alternative to a more permanent housing structure for many Mongolians. According to analysis of the baseline population, the dwelling type and geographical location has a significant impact on the amount of coal consumed in the baseline population, therefore the dwelling type was considered to be a factor that would have significant impact on coal consumption in the project scenario (See **ANNEX 5 – Baseline Fuel Consumption Analysis**). Therefore stoves are divided by dwelling type and geographical location in monitoring and crediting.

The installation date of a CEP, which is the date when a XacBank representative visits the household and confirms installation of the product, is the start of crediting for each individual CEP. Stoves are credited according to the dwelling type in which they are located, either a house or a Ger.

Summary Installations of CEPs

Installation Month-Year	Stove-House*	Stove-Ger*	Ger Blanket	Total CEPs
Heating Season 2016-17	4,465	14,173	1,270	19,908

*Stoves with unknown dwelling type are conservatively considered to be located in dwelling type with lower ER for this particular heating season.

Source: **ANNEX 1 - ER Calculations & HES-2016-17**

2. Insulation products: Ger blankets

The ger-blanket models under this CPA are:

³ Technical specifications are provided to verifying DOE as Supporting Documents

- 4-walled model
- 5-walled model

A ger insulation blanket is an insulated blanket which can go over the traditional wool felt ger covering or replace it. It has a double layer of insulation inside and a waterproof layer outside. The blanket comes in six sections, including a special door covering and a section that covers the base of the ger on the outside to keep out wind, water and dirt.

Previously, well-insulated ger blankets were not available on the market due to market barriers. Ger producers did not think there was a demand for the product, because low income people could not afford them, and because marketing and distribution were difficult given the large geographic spread of ger homes. XacBank LLC worked with local small and medium enterprises to develop a high quality ger blanket, and then created the clean energy financing program that would make the products affordable.

2. Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.)

The starting date of the project activity is 26/01/2012, as stated in the registered CPA-DD. However the first CEP included in the project activity was installed on 03/05/2013 (Source: **ANNEX 7** - MicroEnergy Credits Tracker Database).

The official start date of the CPA No. 8142-0001 and PoA crediting period is 01/01/2013. The PoA conservatively only credits the reduction in coal used during the heating season, as coal usage during the summer is minimal, used only for cooking. As reported in the Household Energy Survey, more than 99% of households report using less or the same amount of coal in summer after adopting the CEP (see **ANNEX 1** - ER Calculations & HES-2016-17)

The first monitoring period had covered the duration from 01/08/2013 - 30/04/2014 (Both days included). The second monitoring period had covered the duration from 01/05/2014 - 30/04/2016 (Both days included). Although, the third (current) monitoring period spans from 01/05/2016 to 30/04/2017 (Both days included), but only the heating seasons would be covered for crediting: Crediting starts from the start of the 2016-2017 heating season: 01/08/2016 and ends on 30/04/2017 (Both days included).

3. Total GHG emission reductions or net anthropogenic GHG removals by sinks: 46,045 tCO₂e

Table 1: Total GHG emissions reductions and GWh_{thermal} Savings

Project Activity	tCO ₂ e	GWh _{th} (Savings)
CPA No. 001 – 2016-17 Heating Season	46,045	133

Source:

ANNEX 1 - ER Calculations & HES-2016-17

Per AMS-II.E, the aggregate energy savings of a single CPA may not exceed 180 GWh_{th} thermal per year. As demonstrated above, CPA No. 8142-0001 is below the threshold. Calculations of GWh_{th} thermal are demonstrated in **ANNEX 1** - ER Calculations & HES-2016-17

This is incorrect referencing from the annexes furnished for TR

C.2. Location of CPAs

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The host party of the project activity is Mongolia.



Figure 1: National Map of Mongolia (Source: Asian Development Bank)

The boundary of the CPA No. 8142-0001 is determined by the location of the households where the CEPs are installed, but is limited to the boundaries of Mongolia. The location of each clean energy installation⁴ is recorded in MEC's Tracker Platform, which has been designed specifically for accelerating microfinance access to clean and efficient energy (See **ANNEX 2** - MicroEnergy Credits Tracker Platform Summary). These locations define the more precise boundary of the project activity.

GPS coordinates for Ulaanbaatar (focal point of CPAs): 47.9200° N, 106.9200° E

The Tracker Platform is used to collect and store information for each CEP, including the unique identification number or sysnum, location, order date, installation date, and usage status of each CEP in the CPA, making it easy to identify, locate, and verify the installations that pertain to the CPA. The MEC Tracker Platform is a hosted internet service, limiting the risk of loss of data.

The six districts where CEPs are disseminated under this CPA are:

- Bayangol
- Bayanzurkh
- Chingeltei

⁴ Location is defined by one of the following sets of information:

- A. Precise GPS location of the household that purchases/installs clean energy product.
- B. Credible address for household.
- C. Three of the following identifiers: Purchaser name, household address, phone number, bank ID number, national ID number, unique identification number, household GPS location, or GPS location within one mile of household.

- Khan Uul
- Songinokhairkhan
- Sukhbaatar

All these districts fall under the boundary of the CPA, i.e. within the boundary of Mongolia.

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines

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There was a temporary deviation submitted during the previous issuance to account for the fact that during previous monitoring period, only efficient cooking and heating stoves were credited. Ger blankets were conservatively not credited, though they were included in the CPAs. However, during current monitoring period Ger blankets have been credited.

C.3.2. Corrections

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Not applicable

C.3.3. Changes to the start date of the crediting period

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Not applicable

C.3.4. Inclusion of monitoring plan

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Not applicable

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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Not applicable

C.3.6. Changes to project design

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Not applicable

SECTION D. Description of monitoring system of CPAs

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Monitoring of CPA No. 8142-0001:

Stage 1: MEC Tracker Platform - for determination of installation date, N_{all} , District Name, and household type

Stage 1 of the monitoring methodology determines the following parameters:

- N_{all} – accurate number of CEPs
- $DW_{y,type}$ – dwelling type, house or ger [required for calculation of $C_{y,old,CEP-i}$]
- D_y , Songinokhairkhan – district, if in Songinokhairkhan district [required for calculation of $C_{y,old,CEP-i}$]
- D_y , Bayangol – district, if in Bayangol district [required for calculation of $C_{y,old,CEP-i}$]

All CEPs disseminated under the CPA are assigned a unique identifier number, the “sysnum”, in the MEC Tracker Platform at the time of sale. Each unique sysnum is assigned to one CEP based

on installation date to ensure no double counting. Because the MEC Tracker Platform serves as the sales database for all CPAs, duplicate instances of products can easily be checked and resolved.

The Credit Tracker Platform also includes the following information:

- Household name
- Passport number of purchaser
- Mobile phone number of purchaser
- Location of household (address and/or GPS location)
- Product type installed, i.e. stove or ger blanket
- Product model installed
- Date of sale
- Date of installation
- Unique identifier number for CEP (sysnum)
- Dwelling type categorized as house or ger
- District name
- CPA Assignment (based on sales date)

Household name, purchaser passport number, purchaser mobile number, and location are used to locate end users for surveys or other customer follow-up. Product type and dwelling type are used for assigning CEPs to one of the crediting categories in this monitoring period. District name and dwelling type are needed for calculation of the baseline coal consumption using the Baseline Coal Consumption Regression Model (**ANNEX 3** - MCA-Mongolia Household Survey Report), and defined in ex-ante parameters. As noted above, sysnum and installation date are used to uniquely assign individual CEPs to CPAs. There are few dwelling type where classification of a House or GER is not available in the tracker platform. For such cases, these dwellings have been classified into the category with the lower amount of Emission Reductions within that district type. Please refer to worksheet '6. Reference' **ANNEX 1** - ER Calculations & HES-2016-17. Here, for unknown dwelling types, the dwelling type with lower ER per CEP in that district was applied.

QAQC is conducted on the MEC Tracker Platform through multiple mechanisms at both the PO and CME level. The brief description of the processes ensuring the accuracy of the Credit Tracker Platform follows (further information on the development and procedures to ensure database accuracy included in **ANNEX 2** - MicroEnergy Credits Tracker Platform Summary):

- The PO maintains in the MEC Tracker Platform a record of all clean energy products that are installed.
- The PO identifies the exact location of the CEP using GPS location and/or address of the household or organization.
- The emissions parameters required for ex-post management are maintained in the Credit Tracker Platform. These include the number and type of CEPs still in operation.
- The CME uses the MEC Tracker Platform to cross-check the new records with existing records in the MEC Tracker Platform in order to confirm that the installation record is complete, authentic, and that no double-counting occurs.
- The Credit Tracker records are cross-checked with the MFI banking MIS system, so that the number of systems is equivalent to the number of systems that were paid for.
- The CME reviews entries with insufficient information and requires the PO to re-check or collect more information or if insufficient information is gathered, does not include them in a CPA for crediting.
- The CME reviews entries for the location of the product, and if the product is located outside of the project boundary for the CPA, it is not included for crediting.
- The project will be audited by a DOE at minimum biennially. Corrective actions will be taken to ensure more accurate monitoring as necessary, based on the results of the audit.
- All monitored data required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for the PoA, whichever occurs later.
- The electronic files holding installation records are backed up on the Internet, reducing risk of any loss of data.

- The unique system ID number which is linked to a combination of a GPS location or verified address and the passport number of the head of household eliminates any risk of double-counting between CPAs.
- The sampling Household Energy Survey asks enumerators to verify Tracker information, including product type, dwelling type, and product usage status.

Figure 2 below shows the data flow into the MEC Tracker Platform and the QAQC measures taken by the PO and CME, described in further detail in **ANNEX 2 - MicroEnergy Credits Tracker Platform Summary**).

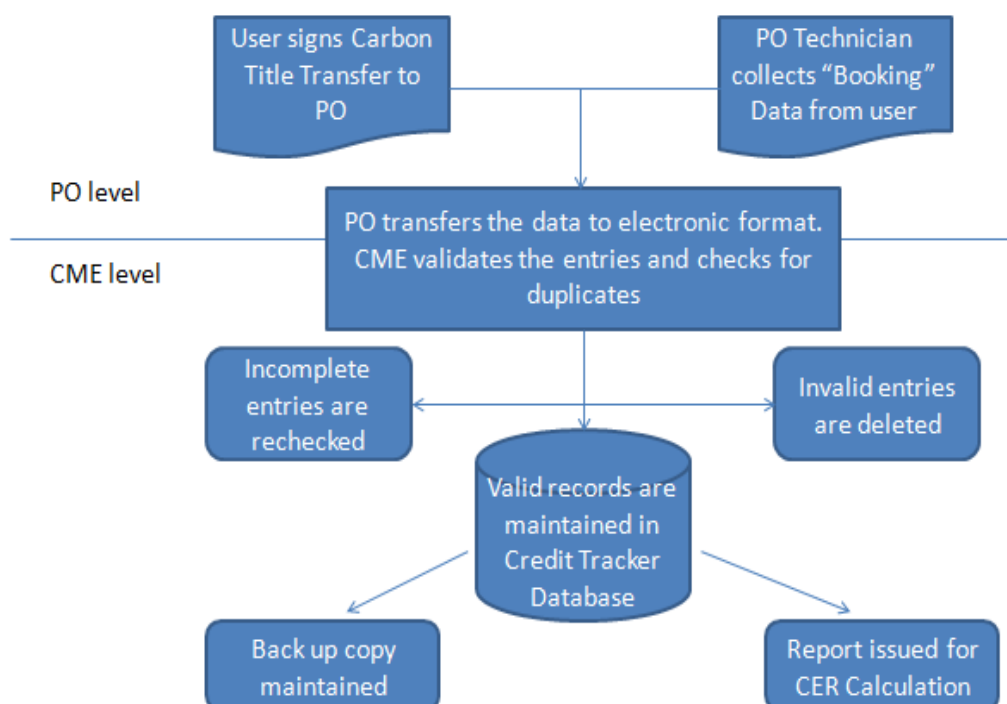


Figure 2: PoA Stage 1 Monitoring Plan

Stage 2: Household Energy Survey (HES)

The HES, ex-post sampling, was conducted to determine the following parameters:

- POF – fraction of CEPs that were in use during monitoring period (by CEP)
- $C_{y,new\ CEPi}$ – project coal consumption (by household)
- $C_{y,old\ CEPi}$ – baseline coal consumption (by household)

Further details of HES is included in **ANNEX 1 - ER Calculations & HES-2016-17**

Sampling was conducted separately within each of the nine sampling frames, therefore sample sizes were calculated to ensure that mean values of POF, $C_{y,new\ CEPi}$, and $C_{y,old\ CEPi}$ determined from the HES met 90/10 confidence and precision for all sampling frames defined in Section B.1.

MEC Tracker Platform was utilized to assign each credited CEP to 1 of the 9 frames, based on dwelling type and district. Simple random sampling within each frame was employed. All aforementioned parameters in Stage 2, except $C_{y,old\ CEPi}$, were determined by asking the sampled households the questions on the HES, including if they were using the product during the heating season, the amount of coal and wood they consumed, their perceptions of air pollution with the new stoves, and the type of coal they used.

$C_{y,old\ CEPI}$ was calculated using the baseline regression model validated at registration and for each sampled household substituting into the equation the appropriate values for CEP dwelling type, district, and average temperature and average wind speed during the heating season.

Complete details of the survey are found in **ANNEX 1 - ER Calculations & HES-2016-17**

The parameters $T_{y,s}$ and $WS_{y,s}$ were calculated based on the daily temperature and windspeed recordings in Ulaanbaatar, Mongolia by NOAA (**ANNEX 1 - ER Calculations & HES-2016-17**). The parameter η_{new} was determined through third party testing of stoves included in the project (**ANNEX 4 - Stove Testing Reports**).

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

Data / Parameter:	NCV_{coal}
Unit:	TJ/tonne
Description:	Net calorific value of the coal that is substituted.
Source of data:	IPCC 2006
Value(s) applied:	0.0189
Choice of data or measurement methods and procedures	
Purpose of data:	Calculation of baseline emissions Calculation of project emissions
Additional comment:	

Data / Parameter:	EF_{coal}
Unit:	tCO ₂ /TJ
Description:	Emission factor: subbituminous coal
Source of data:	IPCC 2006
Value(s) applied:	96.1
Choice of data or measurement methods and procedures	
Purpose of data:	Calculation of baseline emissions Calculation of project emissions
Additional comment:	

Data / Parameter:	<i>Baseline Coal Consumption Regression Model</i>
Unit:	variable
Description:	Regression coefficients for the determination of baseline coal consumption
Source of data:	Baseline Report (ANNEX 5 - Baseline Fuel Consumption Analysis , ANNEX 3 - MCA-Mongolia Household Survey Report)

Value(s) applied):	$C_{y,old,CEPi} = 4.57681 - (0.67248 \sum WS_{y,s}) - (0.01124 \sum T_{y,s}) + 0.14638DW_{y,house} - 0.36234D_{y,Bayangol}$ <p>Where the following are monitored parameters:</p> <p>$C_{y,old,CEPi}$ = Mean coal consumption during the heating season (Autumn, Winter, Spring)</p> <p>$T_{y,s}$ = Mean temperature in Celsius for year y and season s (Autumn, Winter, Spring, Summer)</p> <p>$WS_{y,s}$ = Mean wind speed in Knots for year y and season s (Autumn, Winter, Spring, Summer)</p> <p>$DW_{y,house}$ = Dwelling is a house (dummy variable 1=house, 0=ger)</p> <p>$D_{y,Songinokhairkhan}$ = District location is Songinokhairkhan district (dummy variable 1=yes, 0=no)</p> <p>$D_{y,Bayangol}$ = District location is Bayangol district (dummy variable 1=yes, 0=no)</p> <p>Applied regression analysis found the five aforementioned independent variables to have a statistically significant effect on coal consumption.</p>
Choice of data or measurement methods and procedures	
Purpose of data:	Calculation of baseline emissions
Additional comment:	See ANNEX 5 - Baseline Fuel Consumption Analysis.

Data / Parameter:	<i>Baseline Biomass Consumption Regression Model</i>
Unit:	variable
Description:	Regression coefficients for the determination of baseline biomass consumption
Source of data:	Baseline Report (ANNEX 5 - Baseline Fuel Consumption Analysis, ANNEX 3 - MCA-Mongolia Household Survey Report)
Value(s) applied):	$B_{y,old,CEPi} = 3.42434 - (0.46183 \sum WS_{y,s}) - (0.00748 \sum T_{y,s}) + 0.57023D_{y,Songinokhairkhan} - 0.14078D_{y,Chingeltei}$ <p>Where:</p> <p>$B_{y,old,CEPi}$ = Mean biomass consumption during the heating season (Autumn, Winter, Spring)</p> <p>$T_{y,s}$ = Mean temperature in Celsius for year y and season s (Autumn, Winter, Spring, Summer)</p> <p>$WS_{y,s}$ = Mean wind speed in Knots for year y and season s (Autumn, Winter, Spring, Summer)</p> <p>$D_{y,Songinokhairkhan}$ = District location is Songinokhairkhan district (dummy variable 1=yes, 0=no)</p> <p>$D_{y,Bayangol}$ = District location is Bayangol district (dummy variable 1=yes, 0=no)</p> <p>$D_{y,Chingeltei}$ = District location is Chingeltei district (dummy variable 1=yes, 0=no)</p>
Choice of data or measurement methods and procedures	
Purpose of data:	Calculation of baseline emissions
Additional comment:	See ANNEX 5 - Baseline Fuel Consumption Analysis.

E.2. Data and parameters monitored

Data / Parameter:	N _{all}																																			
Unit:	Number																																			
Description:	Total number of CEPs disseminated.																																			
Measured/ Calculated / Default:	Number of CEP installations disseminated is recorded in the MEC credit tracker platform.																																			
Source of data:	MEC Credit Tracker Platform																																			
Value(s) of monitored parameter:	<div>For Heating Season 2016-2017</div> <table><tr><th>Crediting Category (by CEP):</th><th>N_{all}</th><th>Total CEP-Heating Seasons</th></tr><tr><td>1. House-Song.</td><td>1,148</td><td>1,144</td></tr><tr><td>2. House-Bayan.</td><td>957</td><td>986</td></tr><tr><td>3. House-Other</td><td>2,360</td><td>2,351</td></tr><tr><td>4. Ger-Song.</td><td>4,594</td><td>4,367</td></tr><tr><td>5. Ger-Bayan.</td><td>1,986</td><td>1,946</td></tr><tr><td>6. Ger-Other</td><td>7,593</td><td>7,264</td></tr><tr><td>7. Ger – song - blanket</td><td>778</td><td>775</td></tr><tr><td>8. Ger – Bayan - blanket</td><td>76</td><td>76</td></tr><tr><td>9. Ger – other - blanket</td><td>416</td><td>414</td></tr><tr><td>Total</td><td>19,908</td><td></td></tr></table> <div>See ANNEX 1 - ER Calculations & HES-2016-2017 for details of N_{all}</div>			Crediting Category (by CEP):	N _{all}	Total CEP-Heating Seasons	1. House-Song.	1,148	1,144	2. House-Bayan.	957	986	3. House-Other	2,360	2,351	4. Ger-Song.	4,594	4,367	5. Ger-Bayan.	1,986	1,946	6. Ger-Other	7,593	7,264	7. Ger – song - blanket	778	775	8. Ger – Bayan - blanket	76	76	9. Ger – other - blanket	416	414	Total	19,908	
Crediting Category (by CEP):	N _{all}	Total CEP-Heating Seasons																																		
1. House-Song.	1,148	1,144																																		
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8. Ger – Bayan - blanket	76	76																																		
9. Ger – other - blanket	416	414																																		
Total	19,908																																			
Monitoring equipment:	n/a																																			
Measuring/ Reading/ Recording frequency:	Continuous monitoring/recording																																			
Calculation method (if applicable):	N _{all} is the total number CEPs installed and credited during the monitoring period. N _{all} is adjusted according to actual operational days during a given monitoring period to derive 'Total CEP-Heating Seasons'. The installation date for each CEP listed in Credit Tracker signifies the start of operation for each CEP. The operational days of each CEP is divided by the total number of days of the current monitoring period to determine each individual CEP's 'CEP-Heating Season', the sum of which is 'Total CEP-Heating Seasons'.																																			
QA/QC procedures:	See ANNEX 1 - ER Calculations & HES-2016-17 for details of calculations related to N _{all}																																			
Purpose of data:	Calculation of baseline emissions Calculation of project emissions																																			
Additional comment:	<div>All CEPs disseminated under the PoA have a unique identifier number, 'sysnum' allowing to doubtlessly identify the CEP.</div> <div>Each CEP record in the MEC Tracker Database shall also contain appliance type, date of installation, and geographic location (through GPS coordinates or other specific location identifiers) allowing appliance to be monitored on a regular basis.</div> <div>Per requirements of the PoA, location is defined by one of the following sets of information: A. Precise GPS location of the household that purchases/installs clean energy product. B. GPS location within one mile of the household and credible address for household. C. The following identifiers: Purchaser name, household address, phone number.</div> <div>For evidence of the above, see ANNEX 1 - ER Calculations & HES-2016-17</div>																																			

	<p>There were few dwellings where dwelling types are unknown. However, the lower ER for the dwelling types has been conservatively applied. Because of the change in dwelling type with lower ER per CEP in different heating season, there is a slight variation in the number (Nall) across different heating seasons for the different crediting categories. The overall number of CEP remains same across both the heating seasons.</p> <p>For heating season 2016-17 following was applied:</p> <table> <tr> <th>Dwelling type - District</th><th>Applied Frame</th></tr> <tr> <td>House-Song.</td><td>House-Song.</td></tr> <tr> <td>House-Bayan.</td><td>House-Bayan.</td></tr> <tr> <td>House-Other</td><td>House-Other</td></tr> <tr> <td>Ger-Song.</td><td>Ger-Song.</td></tr> <tr> <td>Ger-Bayan.</td><td>Ger-Bayan.</td></tr> <tr> <td>Ger-Other</td><td>Ger-Other</td></tr> <tr> <td>Unknown-Song.</td><td>Ger-Song.</td></tr> <tr> <td>Unknown-Bayan.</td><td>Ger-Bayan.</td></tr> <tr> <td>Unknown-Other</td><td>Ger-Other</td></tr> <tr> <td>Blanket-Song</td><td>Blanket-Song</td></tr> <tr> <td>Blanket-Bayan</td><td>Blanket-Bayan</td></tr> <tr> <td>Blanket-Other</td><td>Blanket-Other</td></tr> </table>	Dwelling type - District	Applied Frame	House-Song.	House-Song.	House-Bayan.	House-Bayan.	House-Other	House-Other	Ger-Song.	Ger-Song.	Ger-Bayan.	Ger-Bayan.	Ger-Other	Ger-Other	Unknown-Song.	Ger-Song.	Unknown-Bayan.	Ger-Bayan.	Unknown-Other	Ger-Other	Blanket-Song	Blanket-Song	Blanket-Bayan	Blanket-Bayan	Blanket-Other	Blanket-Other
Dwelling type - District	Applied Frame																										
House-Song.	House-Song.																										
House-Bayan.	House-Bayan.																										
House-Other	House-Other																										
Ger-Song.	Ger-Song.																										
Ger-Bayan.	Ger-Bayan.																										
Ger-Other	Ger-Other																										
Unknown-Song.	Ger-Song.																										
Unknown-Bayan.	Ger-Bayan.																										
Unknown-Other	Ger-Other																										
Blanket-Song	Blanket-Song																										
Blanket-Bayan	Blanket-Bayan																										
Blanket-Other	Blanket-Other																										

Data / Parameter:	POF - Product Operation Fraction																		
Unit:	Fraction																		
Description:	<p>Fraction of CEP installations which are in use and operational.</p> <p>Determined for the following six crediting categories for Issuance 3:</p> <ol style="list-style-type: none"> 1. House-Song. 2. House-Bayan. 3. House-Other 4. Ger-Song. 5. Ger-Bayan. 6. Ger-Other 7. Blanket-Song. 8. Blanket-Bayan 9. Blanket-Other 																		
Measured/ Calculated / Default:	Survey																		
Source of data:	ANNEX 1 - ER Calculations & HES-2016-17																		
Value(s) of monitored parameter:	<p>For 2016-17 heating season</p> <table> <tr> <td>1. House-Song.</td><td>0.89</td></tr> <tr> <td>2. House-Bayan.</td><td>0.89</td></tr> <tr> <td>3. House-Other</td><td>0.89</td></tr> <tr> <td>4. Ger-Song.</td><td>0.90</td></tr> <tr> <td>5. Ger-Bayan.</td><td>0.88</td></tr> <tr> <td>6. Ger-Other</td><td>0.89</td></tr> <tr> <td>7. Blanket-Song.</td><td>0.87</td></tr> <tr> <td>8. Blanket-Bayan</td><td>0.88</td></tr> <tr> <td>9. Blanket-Other</td><td>0.88</td></tr> </table>	1. House-Song.	0.89	2. House-Bayan.	0.89	3. House-Other	0.89	4. Ger-Song.	0.90	5. Ger-Bayan.	0.88	6. Ger-Other	0.89	7. Blanket-Song.	0.87	8. Blanket-Bayan	0.88	9. Blanket-Other	0.88
1. House-Song.	0.89																		
2. House-Bayan.	0.89																		
3. House-Other	0.89																		
4. Ger-Song.	0.90																		
5. Ger-Bayan.	0.88																		
6. Ger-Other	0.89																		
7. Blanket-Song.	0.87																		
8. Blanket-Bayan	0.88																		
9. Blanket-Other	0.88																		
Monitoring equipment:	n/a																		
Measuring/	Annually for representative sample of appliances installed.																		

Reading/ Recording frequency:	For Heating Season 2016-17 Applicable HES was conducted in May 2017
Calculation method (if applicable):	Number of households who reported they were using CEP divided by total number of households surveyed of same dwelling type that purchased CEP type.
QA/QC procedures:	The PO conducted the survey with assistance provided by 3 rd party consultant who provided survey, training materials, and survey protocol. Training was conducted for enumerators and testers. See ANNEX 1 - ER Calculations & HES-2016-17 for further details of calculations.
Purpose of data:	Calculation of baseline emissions Calculation of project emissions
Additional comment:	

Data / Parameter:	$C_{y,new,CEP-i}$																		
Unit:	Tonnes coal/HH/heating season																		
Description:	<p>$C_{y,new,CEP-i}$ represents the quantity of coal used in the heating season in the project scenario for CEP-i installation, weighted average if multiple clusters of CEP for target groups in Ger Area homes.</p> <p>Determined for the following six crediting categories for Issuance 3:</p> <ol style="list-style-type: none"> 1. House-Song. 2. House-Bayan. 3. House-Other 4. Ger-Song. 5. Ger-Bayan. 6. Ger-Other 7. Blanket-Song. 8. Blanket-Bayan 9. Blanket-Other 																		
Measured/ Calculated / Default:	Survey																		
Source of data:	Household Energy Survey (HES)																		
Value(s) of monitored parameter:	<p>For 2016-17 heating season</p> <table> <tr><td>1. House-Song.</td><td>3.81</td></tr> <tr><td>2. House-Bayan.</td><td>3.50</td></tr> <tr><td>3. House-Other</td><td>3.58</td></tr> <tr><td>4. Ger-Song.</td><td>3.44</td></tr> <tr><td>5. Ger-Bayan.</td><td>3.17</td></tr> <tr><td>6. Ger-Other</td><td>3.44</td></tr> <tr><td>7. Blanket-Song.</td><td>4.17</td></tr> <tr><td>8. Blanket-Bayan</td><td>3.59</td></tr> <tr><td>9. Blanket-Other</td><td>3.93</td></tr> </table>	1. House-Song.	3.81	2. House-Bayan.	3.50	3. House-Other	3.58	4. Ger-Song.	3.44	5. Ger-Bayan.	3.17	6. Ger-Other	3.44	7. Blanket-Song.	4.17	8. Blanket-Bayan	3.59	9. Blanket-Other	3.93
1. House-Song.	3.81																		
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7. Blanket-Song.	4.17																		
8. Blanket-Bayan	3.59																		
9. Blanket-Other	3.93																		
Monitoring equipment:	n/a																		
Measuring/ Reading/ Recording frequency:	<p>Annually for representative sample of appliances installed.</p> <p>For Heating Season 2016-17 Applicable HES was conducted in May 2017</p>																		

Calculation method (if applicable):	<p>HES questions are framed in the quantity of units in which households purchase coal, i.e. Zil-130, Porter, or Bag. For example, "how many porters of coal did you use last Autumn?"</p> <p>Calculation of $C_{y,new,CEP-i}$ is the quantity of each unit used multiplied by the quantity of coal in each unit, as demonstrated below.</p> <p>Household Coal consumption per season (ton) = # Zil-130 used *(5 ton/Zil) + # of porters used *(1.72 ton/porter) + # of Government Baganuur bags used (.04 ton/bag) + # Other bags used *(0.0221 ton/bag)</p> <p>Coal consumption across the heating season is the sum of coal consumption in Autumn, Winter, and Spring. $C_{y,new,CEP-i}$ is calculated by taking the mean value of coal consumption for the heating season for the sampling frame. $C_{y,new,CEP-i}$ meets 90/10 confidence precision for each sampling frame.</p> <p>See ANNEX 1 - ER Calculations & HES-2016-17 for further details.</p>
QA/QC procedures:	The PO conducted the survey with assistance provided by 3 rd party consultant, who provided survey, training materials, and survey protocol. Training was conducted for enumerators and testers.
Purpose of data:	Calculation of project emissions
Additional comment:	

Data / Parameter:	$C_{y,old,CEPi}$																		
Unit:	Tonnes coal/HH/heating season																		
Description:	<p>Quantity of coal used in the baseline cluster (installation cluster CEP (i) may represent baseline for single or multiple CEP installations, thus addressing cross-effects).</p> <p>Determined for following crediting categories for Issuance 3:</p> <ol style="list-style-type: none"> 1. House-Song. 2. House-Bayan. 3. House-Other 4. Ger-Song. 5. Ger-Bayan. 6. Ger-Other 7. Blanket-Song. 8. Blanket-Bayan 9. Blanket-Other 																		
Measured/ Calculated / Default:	Calculated																		
Source of data:	Household type and location from MEC Tracker Platform; local wind speed and temperature data from NOAA climate data base; district baseline regression model (see ANNEX 1 - ER Calculations & HES-2016-17. Calculated for households included in the HES.																		
Value(s) of monitored parameter:	<table> <tr> <td>For 2015-16 heating season</td> <td></td> </tr> <tr> <td>1. House-Song.</td> <td>5.72</td> </tr> <tr> <td>2. House-Bayan.</td> <td>4.27</td> </tr> <tr> <td>3. House-Other</td> <td>5.36</td> </tr> <tr> <td>4. Ger-Song.</td> <td>5.28</td> </tr> <tr> <td>5. Ger-Bayan.</td> <td>3.83</td> </tr> <tr> <td>6. Ger-Other</td> <td>4.92</td> </tr> <tr> <td>7. Blanket-Song.</td> <td>5.28</td> </tr> <tr> <td>8. Blanket-Bayan</td> <td>3.83</td> </tr> </table>	For 2015-16 heating season		1. House-Song.	5.72	2. House-Bayan.	4.27	3. House-Other	5.36	4. Ger-Song.	5.28	5. Ger-Bayan.	3.83	6. Ger-Other	4.92	7. Blanket-Song.	5.28	8. Blanket-Bayan	3.83
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7. Blanket-Song.	5.28																		
8. Blanket-Bayan	3.83																		

	9. Blanket-Other	4.92
Monitoring equipment:	n/a	
Measuring/ Reading/ Recording frequency:	Annually for representative sample of appliances installed. For Heating Season 2016-17 Applicable HES was conducted May 2017	
Calculation method (if applicable):	Regression Model – See ex-ante parameter 'Baseline Coal Consumption Regression Model'	
QA/QC procedures:	The PO conducted the HES with assistance provided by 3 rd Party Consultant, which provided survey, training materials, and survey protocol. Training was conducted for enumerators and testers. See ANNEX 1 - ER Calculations & HES-2016-17 for further details.	
Purpose of data:	Calculation of baseline emissions	
Additional comment:		

Data / Parameter:	$T_{y,s}$ household stoves and/or insulation	
Unit:	Celsius	
Description:	Independent Variable: Mean temperature in Celsius for year y and season s (Autumn, Winter, Spring) for target groups in Ger Area homes	
Measured/ Calculated / Default:	Measured	
Source of data:	(US) National Climatic Data Center Climatic Service Branch of the National Oceanic and Atmospheric Administration (NOAA). See also ANNEX 1 - ER Calculations & HES-2016-17 sheet '9. $T_{y,s}$ and $WS_{y,s}$ Data'	
Value(s) of monitored parameter:	For Heating Season 2016-17 $T_{1, \text{Autumn}}$ 8.1 $T_{1, \text{Winter}}$ -20.9 $T_{1, \text{Spring}}$ -5.6 Values applied for season represent average of daily temperature measurement recorded by NOAA for every day during season, following seasonal definitions below: <ul style="list-style-type: none"> •Autumn – August 2016, September 2016, October 2016 •Winter – November 2016, December 2016, January 2017 •Spring – February 2017, March 2017, April 2017 	
Monitoring equipment:	NOAA weather station	
Measuring/ Reading/ Recording frequency:	Data is extracted and recorded annually for each season; applicable data was extracted in May 2017 for 2016-2017 heating season	
Calculation method (if applicable):	Calculate mean temperature from daily recordings for seasons in question.	
QA/QC procedures:	Confirm that temperature data corresponds to time that seasonal surveys were conducted for year y	
Purpose of data:	Calculation of baseline emissions	
Additional comment:		

Data / Parameter:	$WS_{y,s}$ household stoves and/or insulation
Unit:	knots

Description:	Independent Variable: Mean wind speed in knots for year y and season s (Autumn, Winter, Spring) for target groups in Ulaanbaatar
Measured/ Calculated / Default:	Measured
Source of data:	(US) National Climatic Data Center Climatic Service Branch of the National Oceanic and Atmospheric Administration (NOAA). See also ANNEX 1 - ER Calculations & HES-2016-17, sheets '9. $T_{y,s}$ and $WS_{y,s}$ Data'
Value(s) of monitored parameter:	For Heating Season 2016-2017 $WS_{1, \text{Autumn}}$ 5.5 knots $WS_{1, \text{Winter}}$ 2.7 knots $WS_{1, \text{Spring}}$ 5.3 knots Values applied for season represent average of daily wind speed measurement recorded by NOAA for every day during season, following seasonal definitions below: <ul style="list-style-type: none"> •Autumn – August 2016, September 2016, October 2016 •Winter – November 2016, December 2016, January 2017 •Spring – February 2017, March 2017, April 2017
Monitoring equipment:	NOAA weather station
Measuring/ Reading/ Recording frequency:	Data is extracted and recorded annually for each season; applicable data was extracted in May 2017 for 2016-2017 heating season
Calculation method (if applicable):	n/a
QA/QC procedures:	Check that wind speed data corresponds to time that seasonal surveys were conducted for year y
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	$DW_{y, \text{type}}$, household stoves and/or insulation
Unit:	1=House, 0=Ger
Description:	<i>Independent Variable:</i> Number of dwellings that are houses for target groups in Ger Area homes
Measured/ Calculated / Default:	Measured
Source of data:	MEC Tracker Platform and Household Energy Survey (HES)
Value(s) of monitored parameter:	1 or 0, determined for each household that used product and reported coal consumption in project scenario to calculate baseline coal consumption.
Monitoring equipment:	n/a
Measuring/ Reading/ Recording frequency:	Monitored continuously. Applied annually for HHs sampled in Household Energy Survey. For Heating Season 2016-17 Applicable HES was conducted May 2017
Calculation method (if applicable):	n/a
QA/QC procedures:	Verification of MEC Tracker data through HES, in-person and phone survey.
Purpose of data:	Calculation of baseline emissions
Additional comment:	-

Data / Parameter:	η_{new}															
Unit:	% thermal efficiency															
Description:	Efficiency of the new CEP															
Measured/ Calculated / Default:	Measured															
Source of data:	Credit Tracker and Household Energy Survey															
Value(s) of monitored parameter:	<table border="1"> <thead> <tr> <th>Stove Type</th><th>Thermal Efficiency</th><th>Tester, Year</th></tr> </thead> <tbody> <tr> <td>Royal Single/Mini Dul</td><td>74.3%</td><td>SEET, 2014</td></tr> <tr> <td>Royal Double/Golomt</td><td>75.8%</td><td>SEET, 2014</td></tr> <tr> <td>Silver Turbo/Khas</td><td>77.0%</td><td>SEET, 2014</td></tr> <tr> <td>Silver Mini/ Ulzii</td><td>76.2%</td><td>SEET, 2013</td></tr> </tbody> </table> <p>All tests were conducted by the Stove Emissions and Efficiency Testing (SEET) Laboratory in Ulaanbaatar Mongolia. The laboratory was developed with support from the Asian Development Bank to conduct efficiency, emissions, and stove performance testing, particularly focused on household level stoves. The SEET Lab is currently under management of the national Mongolian University of Science and Technology (MUST). Testing followed the protocol: "UJ SeTAR Centre Standard Operating Procedure: The Heterogeneous Testing Procedure for Thermal Performance and Trace Gas Emissions."</p> <p>Source: ANNEX 4-Stove Testing Reports</p>	Stove Type	Thermal Efficiency	Tester, Year	Royal Single/Mini Dul	74.3%	SEET, 2014	Royal Double/Golomt	75.8%	SEET, 2014	Silver Turbo/Khas	77.0%	SEET, 2014	Silver Mini/ Ulzii	76.2%	SEET, 2013
Stove Type	Thermal Efficiency	Tester, Year														
Royal Single/Mini Dul	74.3%	SEET, 2014														
Royal Double/Golomt	75.8%	SEET, 2014														
Silver Turbo/Khas	77.0%	SEET, 2014														
Silver Mini/ Ulzii	76.2%	SEET, 2013														
Monitoring equipment:	n/a															
Measuring/ Reading/ Recording frequency:	Would be done again in case new stoves are added															
Calculation method (if applicable):	n/a															
QA/QC procedures:																
Purpose of data:	Eligibility criteria #18 for inclusion of CEP in CPA: "The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications"															
Additional comment:	As per registered POA-DD and CPA-DD; the efficiency is to be determined only once when a new CEP is introduced post inclusion. The efficiency test is to be done now only when new model of the CEP is to be added. As there is no CEP added during this monitoring period, hence no new efficiency tests have been conducted.															

E.3. Implementation of sampling plan

>>

Sampling plan is implemented separately for each specific-case CPA. There is no single-sampling applied to all of the specific-case CPAs under this PoA for this monitoring period.

The following parameters have been determined by survey using the sampling approach:

- POF – fraction of CEPs that were in use during monitoring period
- $C_{y,new\ CEPi}$ – project coal consumption
- $C_{y,old\ CEPi}$ – baseline coal consumption

Simple random sampling method has been applied to determine the samples for the monitored parameters (POF, $C_{y,new,CEP-i}$) randomly from the total population. Randomization was done using

random function on Microsoft excel. The monitoring parameter, N_{all} is monitored 100% and continuously through the online credit tracker platform and the monitoring parameter $C_{y_old,CEPi}$ is calculated applying regression analysis as approved at PoA validation and procedure for calculation of the same is fixed. Please refer to **ANNEX 1 - ER Calculations & HES-2016-17** for the surveys done to determine the value of the monitored parameters.

According to the applied methodology (AMS.II.E. version 10), registered PoA-DD and CPA-DD, the parameters POF, $C_{y,new,CEP-I}$ and $C_{y_old,CEPi}$ have to be monitored at least every 2 years, however CME has decided to conduct monitoring surveys and monitor these parameters on an annual basis and accordingly sample size has been determined by satisfying a 90/10 precision (90% confidence interval and 10% margin of error).

The sample size for the monitored parameters, POF, $C_{y,new,CEP-I}$ and $C_{y_old,CEPi}$ has been determined by following the requirements for sampling laid down in “Guidelines for sampling and survey for CDM project activities”.

The dwelling type is decisive for project and baseline coal consumption and hence both dwelling types i.e. ger and stoves are included in this CPA and sampling has been done for both dwelling types. Taking into consideration the comments raised during IRC stage for the previous issuance and to ensure accuracy of results, the total samples determined through simple random sampling on the total population has been further split into districts – Bayangol, Songinokhairkhan and Other. Further, considering possible low response rate and households response bias into account, oversampling has been applied. The sample size that has been taken for year 2016-2017 is 401.

Monitoring surveys have been carried out in six dwelling district combinations or frames namely:

Frame 1: Stove in house dwelling type, located in Songinokhairkhan district

Frame 2: Stove in house dwelling type, located in Bayangol district

Frame 3: Stove in house dwelling type, located in other district

Frame 4: Stove in ger dwelling type, located in Songinokhairkhan district

Frame 5: Stove in ger dwelling type, located in Bayangol district

Frame 6: Stove in ger dwelling type, located in other district

Frame 7: Blanket in Songinokhairkhan district

Frame 8: Blanket-Bayangol district

Frame 9: Blanket-Other district

The split of samples into these frames is as follows –

Heating Season 2016/2017 – Total samples - 401

Dwelling ->	GER			HOUSE		
District - >	Bayangol	Songinokhairkhan	Other	Bayangol	Songinokhairkhan	Other
Frame						
1					45	
2				46		
3						47
4		48				
5	43					
6			47			
7		45				
8.	40					
9.			40			

The mean value of each of the surveyed parameter, standard deviation, standard error, and precision has been calculated as per “Appendix 4. Best practice examples for reliability

calculations provided in the Guidelines for Sampling and surveys for CDM project activities and programmes of activities Version 04.0.” For proportion based reliability test, Standard Error and precision has been calculated as per “Appendix 4. Best practice examples for reliability calculations provided in the Guidelines for Sampling and surveys for CDM project activities and programmes of activities Version 04.0.”

Reliability calculations at the total sample size level and also at the level of the dwelling district combination. Precision is meeting the 10% requirement in both cases for both the Heating seasons.

-Please refer to **ANNEX 1 - ER Calculations & HES-2016-17**

A summary of the HES sampling results are shown in Table 2.1 – 3.1 below. The application of the sampled parameters in calculating emissions reductions is demonstrated in Section E.1. As demonstrated below, each of the parameters met required confidence/precision for both sampling frames.

Table 2.1: POF Survey results for heating season 2016-17

Crediting Category	N	POF	Std. Err.	90% Confidence Level: Precision Achieved	Meets 90/10 Rule?
House-Song.	45	89%	0.05	8.67%	Yes
House-Bayan.	46	89%	0.05	8.47%	Yes
House-Other	47	89%	0.04	8.28%	Yes
Ger-Song.	48	90%	0.04	8.10%	Yes
Ger-Bayan.	43	88%	0.05	9.10%	Yes
Ger-Other	47	89%	0.04	8.28%	Yes
Blanket-Song	45	87%	0.05	9.62%	Yes
Blanket-Bayan	40	88%	0.05	9.83%	Yes
Blanket-Other	40	88%	0.05	9.83%	Yes

Source: **ANNEX 1 - ER Calculations & HES-2016-17**

Table 3.1: $C_{y,new,CEPi}$ Survey results for heating season 2016-17

Crediting Category	N	Mean (tons coal/HH/ heating season)	Standard Deviation	90% Confidence Level: Precision Achieved	Meets 90/10 Rule?
House-Song.	40	3.81	0.81	5.51%	Yes
House-Bayan.	41	3.50	1.11	8.15%	Yes
House-Other	42	3.58	0.63	4.45%	Yes
Ger-Song.	43	3.44	0.62	4.54%	Yes
Ger-Bayan.	38	3.17	0.67	5.61%	Yes
Ger-Other	42	3.44	0.71	5.24%	Yes
Blanket-Song	39	4.17	0.50	3.19%	Yes
Blanket-Bayan	35	3.59	0.79	6.15%	Yes
Blanket-Other	35	3.93	0.98	6.96%	Yes

Source: **ANNEX 1 - ER Calculations & HES-2016-17**

Complete details of the HES survey, data analysis, and results can be found in **ANNEX 1 - ER Calculations & HES-2016-17**

SECTION F. Calculation of emission reductions or net anthropogenic removals

F.1. Calculation of baseline emissions or baseline net removals

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1. Emissions Reductions per product

Emissions reductions are calculated using the following equations:

$$ER_y = \sum_i BE_{y, CEP_i} - PE_{y, CEP_i}$$

Where:

ER_y	Emission reductions during the year y in tCO ₂ e
BE_{y, CEP_i}	Baseline emissions for CEP-i during the year y in tCO ₂ e.
PE_{y, CEP_i}	Project activity emissions for CEP-i during the year y for technology i in tCO ₂ e.

BE_y and PE_y are determined through surveys, which may encompass single CEP or multiple CEP installations in a building or structure. As the baseline study determined that the district in which a household is located affects coal consumption, the CEP and household location is also taken into consideration in dividing the population into frames. The following combinations of installed project CEPs per building were surveyed:

Frame 1: Stove in house dwelling type, located in Songinokhairkhan district ("House - Song.")

Frame 2: Stove in house dwelling type, located in Bayangol district ("House - Bayan.")

Frame 3: Stove in house dwelling type, located in other district ("House-Other")

Frame 4: Stove in ger dwelling type, located in Songinokhairkhan district ("Ger - Song.")

Frame 5: Stove in ger dwelling type, located in Bayangol district ("Ger - Bayan.")

Frame 6: Stove in ger dwelling type, located in other district ("Ger - Other")

Frame 7: Ger blanket, located in Songinokhairkhan district ("Blanket-Song")

Frame 8: Ger blanket, located in Bayangol district ("Blanket-Bayan")

Frame 9: Ger blanket, located in other district ("Blanket-other")

$$BE_{y, CEP-i} = C_{y, old, CEP-i} * NCV_{coal} * EF_{coal}$$

$$PE_{y, CEP-i} = C_{y, new, CEP-i} * NCV_{coal} * EF_{coal}$$

Where:

$C_{y, old, CEP-i}$	Quantity of coal used in the heating season in the absence of the project activity in tons of coal per household per heating season, calculated through baseline regression model (see ANNEX 5 – Baseline Fuel Consumption Analysis)
$C_{y, new, CEP-i}$	Quantity of coal used in the heating season used during the project activity in tons of coal per household per heating season, measured through surveys.
NCV_{coal}	Net calorific value of coal.
EF_{coal}	Emission factor for the amount of CO ₂ e resulting from the combustion of coal

Demonstration of calculations of ER_y for each sampling frame and equivalent crediting category is demonstrated below.

$$BE_y = C_{y_old, CEP-i} * NCV_{coal} * EF_{coal}$$

Heating season 2016-17

Parameter	Unit	House-Song.	House-Bayan.	House-Other	Ger-Song.	Ger-Bayan.	Ger-Other	Blanket-song	Blanket-Bayan	Blanket-other
$C_{y_old, CEP-i}$	tons coal/HH/Heating Season	5.72	4.27	5.36	5.28	3.83	4.92	5.28	3.83	4.92
NCV_{coal}	TJ/ton	0.0189								
EF_{coal}	tCO ₂ e/TJ	96.1								
BE_y	tCO ₂ e/HH/Heating Season	10.38	7.75	9.73	9.58	6.96	8.93	9.58	6.96	8.93

Source: **ANNEX 1** - ER Calculations & HES-2016-17

$$PE_{y, CEP-i} = C_{y_new, CEP-i} * NCV_{coal} * EF_{coal}$$

Heating season 2016-17

Parameter	Unit	House-Song.	House-Bayan.	House-Other	Ger-Song.	Ger-Bayan.	Ger-Other	Blanket-song	Blanket-Bayan	Blanket-other
$C_{y_new, CEP-i}$	tons coal/HH/Heating Season 2016-17	3.81	3.50	3.58	3.44	3.17	3.44	4.17	3.59	3.93
NCV_{coal}	TJ/ton	0.0189								
EF_{coal}	tCO ₂ e/TJ	96.1								
$PE_{y, CEP-i}$	tCO ₂ e/HH/Heating Season 2016-17	6.93	6.36	6.51	6.25	5.75	6.25	7.57	6.52	7.14

Source: **ANNEX 1** - ER Calculations & HES-2016-17

$$ER_y = BE_y - PE_y$$

Parameter	Unit	House-Song.	House-Bayan.	House-Other	Ger-Song.	Ger-Bayan.	Ger-Other	Blanket-song	Blanket-Bayan	Blanket-other
ER_y	tCO ₂ e/HH/Heating Season 2016-17	3.45	1.39	3.22	3.33	1.20	2.68	2.01	0.44	1.79

Source: **ANNEX 1** - ER Calculations & HES-2016-17

In summary, BE_y , PE_y , and ER_y are demonstrated for the two crediting categories in Table 4 below.

Table 4: ER_y by Crediting Category

Heating Season 2016-17

Crediting Category	BE _y (tCO ₂ e/HH/ Heating Season)	PE _y (tCO ₂ e/HH/ Heating Season)	ER _y (tCO ₂ e/HH/ Heating Season)
House-Song.	10.38	6.93	3.45
House-Bayan.	7.75	6.36	1.39
House-Other	9.73	6.51	3.22
Ger-Song.	9.58	6.25	3.33
Ger-Bayan.	6.96	5.75	1.20
Ger-Other	8.93	6.25	2.68
Blanket-Song	9.58	7.57	2.01
Blanket-Bayan	6.96	6.52	0.44
Blanket-Other	8.93	7.14	1.79

2. Emissions Reductions over the monitoring period

POF is taken into consideration for calculation of ER for the monitoring period. Table 5 below demonstrates the emissions reductions in tCO₂e per year by crediting category realized during the monitoring period. Calculation of emissions reductions is included in **ANNEX 1 - ER Calculations & HES-2016-17**

Table 5.1 : Emissions Reductions heating season 2016-17

Crediting Category	ER _y	POF	N _{all}	Total CEP - Heating Seasons	tCO ₂ e
Total	2.17	0.88	19,908	19,324	46,045
House-Song.	3.45	0.89	1,148	1,144	3,509
House-Bayan.	1.39	0.89	957	986	1,223
House-Other	3.22	0.89	2,360	2,351	6,764
Ger-Song.	3.33	0.90	4,594	4,367	13,046
Ger-Bayan.	1.20	0.88	1,986	1,946	2,065
Ger-Other	2.68	0.89	7,593	7,264	17,408
Blanket-Song	2.01	0.87	778	775	1352.49
Blanket-Bayan	0.44	0.88	76	76	29
Blanket-Other	1.79	0.88	416	414	649

Source: **ANNEX 1 - ER Calculations & HES-2016-17**

Emissions reductions are calculated for each 'CEP Heating Season' accrued in the monitoring period, or the portion of the monitoring period that the CEP was installed and active.

Emissions reductions for each crediting period are calculated by multiplying ER_y per product, adjusted N_{all} (or Total CEP-Heating Seasons), and the POF for each crediting category.

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F.2. Calculation of project emissions or actual net removals

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The project emission calculations have been elaborated in the section H.1 above. These have been arrived at on the basis of coal consumed by project CEPs during each of the heating seasons 2014-15 and 2015-16 as demonstrated below:

$$PE_{y,CEP-i} = C_{y,new,CEP-i} * NCV_{coal} * EF_{coal}$$

Heating season 2016-17

Parameter	Unit	House-Song.	House-Bayan.	House-Other	Ger-Song.	Ger-Bayan.	Ger-Other	Blanket-song	Blanket-Bayan	Blanket-other
$C_{y,new,CEP-i}$	tons coal/HH/Heating Season 2016-17	3.81	3.50	3.58	3.44	3.17	3.44	4.17	3.59	3.93
NCV_{coal}	TJ/ton	0.0189								
EF_{coal}	tCO ₂ e/TJ	96.1								
$PE_{y,CEP-i}$	tCO ₂ e/HH/Heating Season 2016-17	6.93	6.36	6.51	6.25	5.75	6.25	7.57	6.52	7.14

Source: **ANNEX 1** - ER Calculations & HES-2016-17

F.3. Calculation of leakage emissions

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1. Displaced stoves

As stated in the PDD, leakage may be considered if the displaced baseline stove is not dismantled or if it is put to a secondary purpose that does not involve cooking or heating. The PoA aims to dismantle 100% of old stoves. According to XacBank operating procedures, every household must give up their old stove at the time of installation of the new stove (see **ANNEX 6** - Stove Dismantling Procedures). The stove is collected by the XacBank representative at time of installation and stored in a container at the sales center. XacBank has an on-going contract with a local stove dismantling company which picks up the old stoves in the container and destroys them. The scrap metal is then sold to a recycling company. XacBank and project partners agreed that for households that demonstrate with official government letter they are a newly married couple or a household that is otherwise purchasing their first stove, the old stove requirement is waived as there is no previous stove to surrender (see **ANNEX 6** - Stove Dismantling Procedures).

The HES included a survey question asking respondents about the fate of the previous stove which confirmed the procedures outlined above. Of households surveyed, all the households reported that they gave up their stove at installation.

2. NRB Consumption

Wood is used as a starter fuel in the use of both baseline stoves and efficient stoves. While the consumption of biomass is expected to decrease, the project conservatively does not credit reduction in wood consumption. The consumption of wood in the project scenario was monitored to ensure that consumption did not increase as a result of using the efficient stove. This parameter is compared to the calculated value of baseline biomass consumption, derived from the ex-ante parameter, *Baseline Biomass Consumption Regression Model*.

As demonstrated in **ANNEX 1** - ER Calculations & HES-2016-17, households saved wood in the project scenario. As such, no leakage is considered due to wood consumption. Summary of wood consumption is shown in Table 8.1-8.2 below.

Table 6.1: Change in wood consumption (m3) for heating season 2016-17

	All Stoves
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	Mean (m ³)
Baseline biomass consumption	4.44
Project biomass consumption	2.45
Change in biomass consumption (Baseline - Project Biomass Consumption)	1.99

Source: **ANNEX 1** - ER Calculations & HES-2016-17

F.4. Calculation of emission reductions or net anthropogenic removals

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
8142-0001	155.362	109,317	0	0	46,045	46,045
Total	155.362	109,317	0	0	46,045	46,045

F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante (t CO ₂ e)
8142-0001	46,045	50,133
Total	46,045	50,133

F.6. Remarks on increase in achieved emission reductions

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Emissions reductions achieved during the monitoring period are lower than the values estimated in the ex-ante calculation of registered CPA-DD.