Verification and certification 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.

BASIC INFORMATION		
Title and UNFCCC reference number of the programme of activities (PoA)	Title: Sichuan Rural Poor-Household Biogas Development Programme UNFCCC reference number: 2898	
Version number(s) of the PoA-DD(s) to which this report applies	2	
Version number of the verification and certification report	01	
Completion date of the verification and certification report	17/08/2018	
Monitoring period number and duration of this morning period	Monitoring period number: 5th Duration of this morning period: 01/01/2016 – 31/12/2016 (both days are included)	
Number and version number of the monitoring report to which this report applies	Number of the monitoring report: Single monitoring report is prepared for all covered CPAs for this monitoring period Version number of the monitoring report: 2	
Coordinating/managing entity (CME)	Chengdu Oasis Science & Technology Co., Ltd.	
Host Parties	Host Parties of the PoA	Is this a host Party to a CPA covered in this report? (yes/no)
	People's Republic of China	Yes
Applied methodologies and standardized baselines	Methodologies: AMS-I.I.– *Biogas/biomass thermal applications for households/small users* (version 04) (EB68, Annex 25); AMS-III.R.– *Methane recovery in agricultural activities at household/small farm level* (version 02) (EB59, Annex 4) Standardized baselines: N/A	
Mandatory sectoral scopes linked to the applied methodologies	Scope 1: Energy industries (renewable - / non-renewable sources) Scope 13: Waste handling and disposal	
Conditional sectoral scopes linked to the applied methodologies, if applicable	N/A	
Estimated amount of GHG emission reductions or GHG removals for this monitoring period in the included CPAs covered in this report	876,123 tCO_2e	
Certified amount of GHG emission reductions or GHG removals for this	816,778 tCO_2e	

monitoring period for the included CPAs covered in this report	
Name and UNFCCC reference number of the DOE	DOE Name: Shenzhen CTI International Certification Co., Ltd (CTI) UNFCCC reference number of the DOE: E-0061
Name, position and signature of the approver of the verification and certification report	Zhou Lu General Manager 

SECTION A. Executive summary

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UPM Umwelt-Projekt-Management GmbH has commissioned the DOE Shenzhen CTI International Certification Co., Ltd (CTI) to perform the 5th periodic verification of the CDM Programme of Activities "Sichuan Rural Poor-Household Biogas Development Programme" in Sichuan Province, P. R. China (hereafter "PoA"). This report summarises the findings of the verification of the project, performed on the basis of paragraph 62 of the CDM modalities and procedures, as well as criteria given to provide for consistent project operations, monitoring and reporting and the subsequent decisions by the CDM Executive Board. Verification is required for all registered CDM project activities as well as programme of activities intending to confirm their achieved emission reductions and proceed with request for issuance of CERs. This report contains the findings from the verification and a certification statement for the certified emission reductions.

Verification is the periodic independent review and *ex post* determination of both quantitative and qualitative information by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM programme of activities during a defined monitoring period.

Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification is to verify and certify emission reductions reported for the "Sichuan Rural Poor-Household Biogas Development Programme" in Sichuan Province, P. R. China (UNFCCC Ref. No. 2898) for the period 01/01/2016-31/12/2016.

The purpose of verification is to review the monitoring results and verify that monitoring methodology was implemented according to monitoring plan and monitoring data, used to confirm the reductions in anthropogenic emissions by sources is sufficient, definitive and presented in a concise and transparent manner.

In particular, monitoring plan, monitoring report and the PoA's compliance with relevant UNFCCC and host Party criteria are verified in order to confirm that the PoA has been implemented in accordance with previously registered design and conservative assumptions, as documented and also if the monitoring plan is in compliance with the approved monitoring methodology.

The scope of the verification is:

- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.
- Where sampling is involved, sampling guidelines are applied to ensure the adequate sampling and survey method is followed in reaching professional judgements.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified. The verification comprises a review of the monitoring report over the monitoring period 01/01/2016-31/12/2016 based on the registered PoA-DD in part of the monitoring parameters and monitoring plan, emission reduction calculation spreadsheet, monitoring methodology and all related

evidence provided by project participants. On-site visit and stakeholders' interviews are also performed as part of the verification process.

The verification has been performed as described in the CDM validation and verification standard for programme of activities (version 01.0)/34/ and constitutes the following steps:

- Publication of the MR on the UNFCCC website (17/05/2018)
- Desk review of the MR (version 1 dated 07/05/2018)/1/ and the relevant documents
- On-site assessment (02/07/2018 to 10/07/2018)
- Issuance of draft verification report & verification protocol
- Desk review of the revised MR and related documents
- Resolution of the raised CAR
- Issuance of the final verification report

The on-site visit from 02/07/2018 to 10/07/2018 was carried out 21 days after the global publication of the MR on 17/05/2018, which is in conformity with the requirement in paragraph 206 of CDM project cycle procedure for programme of activities (Version 01.0)/36/.

The PoA aims to reduce a large amount of greenhouse gases (GHG) by facilitating the installation of a large number of household biogas digesters. To achieve this target, the PoA generates additional incentives to install digesters to households that are supported by existing subsidy schemes. Target group of the PoA are low-income households located in Sichuan Province, China. The primarily targeted areas are thirteen cities (however, the PoA shall not be limited to these thirteen cities exclusively): Yibin, Neijiang, Suining, Ziyang, Zigong, Luzhou, Leshan, Meishan, Mianyang, Guang'An, Ganzi, Aba and Dazhou, all of which are located in Sichuan.

The 5th monitoring period of this PoA consists of the verification of the 87 CPAs, Sichuan Rural Poor-Household Biogas Development Programme, CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087. The verifiers have reviewed the implementation of the monitoring plan (MP) as described in the approved revised PoA-DD/4/ and CPA-DDs/10,11,12,13/. The total number of the households for the 87 CPAs during this monitoring period is 395,435/4/,/10,11,12,13/.

The detailed geographic coordinates of the 87 CPAs included in this monitoring period is listed as below:

CPA reference number	City(ies)	Longitude	Latitude
2898-0001	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0002	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0003	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0004	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0005	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0006	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0007	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0008	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0009	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0010	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0011	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0012	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0013	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N

2898-0014	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0015	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0016	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0017	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0018	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0019	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0020	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0021	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0022	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0023	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0024	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0025	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0026	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0027	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0028	Guang'an	105° 57' - 107° 18' E	30° 01' - 30° 51' N
2898-0029	Guang'an	105° 57' - 107° 18' E	30° 01' - 30° 51' N
2898-0030	Guang'an	105° 57' - 107° 18' E	30° 01' - 30° 51' N
2898-0031	Guang'an	105° 57' - 107° 18' E	30° 01' - 30° 51' N
2898-0032	Suining	105° 03' - 106° 59' E	30° 10' - 31° 10' N
2898-0033	Suining	105° 03' - 106° 59' E	30° 10' - 31° 10' N
2898-0034	Suining	105° 03' - 106° 59' E	30° 10' - 31° 10' N
2898-0035	Dazhou	106° 40' - 108° 33' E	30° 19' - 32° 20' N
2898-0036	Ziyang	104° 11' - 105° 45' E	29° 41' - 30° 39' N
2898-0037	Ziyang	104° 11' - 105° 45' E	29° 41' - 30° 39' N
2898-0038	Ziyang	104° 11' - 105° 45' E	29° 41' - 30° 39' N
2898-0039	Ziyang	104° 11' - 105° 45' E	29° 41' - 30° 39' N
2898-0040	Ziyang	104° 11' - 105° 45' E	29° 41' - 30° 39' N
2898-0041	Ziyang	104° 11' - 105° 45' E	29° 41' - 30° 39' N
2898-0042	Meishan	102° 51' - 104° 30' E	29° 24' - 30° 22' N
2898-0043	Meishan	102° 51' - 104° 30' E	29° 24' - 30° 22' N
2898-0044	Meishan	102° 51' - 104° 30' E	29° 24' - 30° 22' N
2898-0045	Meishan	102° 51' - 104° 30' E	29° 24' - 30° 22' N
2898-0046	Neijiang	104° 16' - 105° 26' E	29° 11' - 30° 02' N
2898-0047	Leshan	102° 54' - 104° 15' E	28° 25' - 29° 56' N
2898-0048	Leshan	102° 54' - 104° 15' E	28° 25' - 29° 56' N
2898-0049	Zigong	104° 02' - 105° 16' E	28° 55' - 29° 38' N
2898-0050	Luzhou	105° 08' - 106° 28' E	27° 39' - 29° 20' N
2898-0051	Luzhou	105° 08' - 106° 28' E	27° 39' - 29° 20' N
2898-0052	Dazhou, Aba	100° 30' - 108° 33' E	30° 19' - 34° 19' N
2898-0053	Guang'an, Dazhou, Leshan	102° 54' - 108° 33' E	28° 25' - 32° 20' N
2898-0054	Luzhou	105° 08' - 106° 28' E	27° 39' - 29° 20' N
2898-0055	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0056	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0057	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0058	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0059	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0060	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0061	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N

2898-0062	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0063	Suining	105° 03' - 106° 59' E	30° 10' - 31° 10' N
2898-0064	Neijiang	104° 16' - 105° 26' E	29° 11' - 30° 02' N
2898-0065	Leshan	102° 54' - 104° 15' E	28° 25' - 29° 56' N
2898-0066	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0067	Guang'an	105° 57' - 107° 18' E	30° 01' - 30° 51' N
2898-0068	Guangan, Dazhou, Meishan, Leshan, Luzhou, Aba and Ganzi	97° 22' - 108° 33' E	27° 39' - 34° 20' N
2898-0069	Mianyang and Meishan	102° 51' - 105° 43' E	29° 24' - 33° 03' N
2898-0070	Mianyang and Neijiang	103° 45' - 105° 43' E	29° 11' - 33° 03' N
2898-0071	Yibin, Suining and Neijiang	103° 36' - 106° 59' E	27° 50' - 31° 10' N
2898-0072	Yibin and Ziyang	103° 36' - 105° 45' E	27° 50' - 30° 39' N
2898-0073	Ziyang and Zigong	104° 11' - 105° 16' E	29° 41' - 29° 38' N
2898-0074	Yibin	103° 36' - 105° 20' E	27° 50' - 29° 16' N
2898-0075	Mianyang	103° 45' - 105° 43' E	30° 42' - 33° 03' N
2898-0076	Dazhou	106° 40' - 108° 33' E	30° 19' - 32° 20' N
2898-0077	Ziyang	104° 11' - 105° 45' E	29° 41' - 30° 39' N
2898-0078	Ziyang	104° 11' - 105° 45' E	29° 41' - 30° 39' N
2898-0079	Meishan	102° 51' - 104° 30' E	29° 24' - 30° 22' N
2898-0080	Neijiang	104° 16' - 105° 26' E	29° 11' - 30° 02' N
2898-0081	Luzhou	105° 08' - 106° 28' E	27° 39' - 29° 20' N
2898-0082	Guang'an, Dazhou, Aba	100° 30' - 108° 33' E	30° 01' - 34° 19' N
2898-0083	Guang'an, Leshan	102° 54' - 107° 18' E	28° 25' - 30° 51' N
2898-0084	Leshan, Luzhou	102° 54' - 106° 28' E	27° 39' - 29° 56' N
2898-0085	Mianyang, Meishan, Luzhou	102° 51' - 106° 28' E	27° 39' - 33° 03' N
2898-0086	Yibin, Mianyang, Suining, Neijiang	103° 36' - 106° 59' E	27° 50' - 33° 03' N
2898-0087	Yibin, Ziyang, Zigong	103° 36' - 105° 45' E	27° 50' - 30° 39' N

In CTI's opinion, the GHG emission reductions reported for the PoA in the monitoring report are fairly stated. It is confirmed that the GHG emission reductions were calculated correctly on the basis of the approved monitoring methodologies AMS-I.I. (Version 04)[/32/], AMS-III.R. (Version 02)[/33/] and the monitoring plan contained in the PoA-DD (Version 2 dated 30/10/2017)[/4/].

CTI confirms that the GHG emission reductions are calculated without material misstatements. Based on the evidence and information that are considered necessary to guarantee that GHG emission reductions are appropriately calculated, CTI is able to certify that emission reductions from the PoA "Sichuan Rural Poor-Household Biogas Development Programme" during the indicated monitoring period.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification team members

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Verification findings
1.	Team Leader	IR	Li	Ziqi	CTI	√	√	√	√
2.	Team Member	IR	Dai	Qinghua	CTI	√	√	√	√

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Lin	Shunrong	CTI
2.	Approver	IR	Zhou	Lu	CTI

SECTION C. Application of materiality in conducting the verification

C.1. Consideration of materiality in planning the verification

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	*Sample*	*Medium*	*Sample size is not suitable; or the surveyed households in the PoA level are not random*	*1. Cross-check the procedure to identify the sample size against the sample guideline[/40/] and standard[/41/], and confirm the sample size is calculated correctly, and chose 200 in a conservation approach, compared 139 (calculated result of sample size). Furthermore, the relative error of the 200 sample results is lower and the statistical quality is sufficient.* *2. Using a central online platform, the CME determined the households to be included in the sampling using a simple random approach and submits the household references to the local data collectors.* *3. CTI conducted a random sample following the sample standard during site-visit period, visited 85 households who are partial sourced from the sample conducted by CME and the others are beyond 200 households survey. Based on the result of acceptance sampling, the monitoring records are deemed acceptable.*
2	*Data management and Human errors*	*Low*	*Typographic errors in the spreadsheets and Human error is likely to occur if the monitoring personnel are not trained well or inexperienced in data recording procedures while recording.*	*4. Require the CME to assess all the data again and confirm that no further errors are made.* *5. All the monitoring personnel are well trained and required to complete the simulated test and ensure each trainee are qualified to undertaken household survey* *6. The hand-written survey records are checked and the data are randomly compared with data in database for the consistency.* *7. Data quality controlled by CME, there are four steps to ensure the data quality and consistency.*

C.2. Consideration of materiality in conducting the verification

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The errors identified in the PoA are below the threshold limit of materiality and hence not material. The GHG emission reductions are calculated without material misstatements.

SECTION D. Means of verification

D.1. Desk/document review

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Desk review of all documents provided by the client and CME and publicly available documents relevant for the verification including monitoring plan, monitoring report, monitoring methodology, project design document, approved post registration change reports, applicable tools in particular attention to the frequency of measurements, QA/QC procedures and other relevant documents was conducted by CTI.

The Monitoring Report Version 1 dated 07/05/2018/1/ submitted by the client was web hosted on the UNFCCC-CDM website on 17/05/2018 and available in the public domain.

In addition to the monitoring documentation provided by the project participants, CIT also reviewed:

(i) The registered PoA-DD and the corresponding validation report/3,47/;

(ii) The registered or included CPA-DDs, including the monitoring plan /5-9/;

(iii) The latest approved PoA-DD and latest approved CPA-DD specific (CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087) /4,10-13/;

(iv) Validation Reports for CPA inclusion Sichuan Rural Poor-Household Biogas Development Programme, CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087 /48-51/;

(v) The post-registration changes validation assessment opinion/56,57/;

(vi) The applied monitoring methodologies/32,33/;

(vii) Previous monitoring reports and verification reports /52-55/;

(viii) Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board/39-41/;

(ix) Any other information and references relevant to the project activity's resulting emission reductions (e.g., IPCC reports etc)/42-46/.

D.2. On-site inspection

Duration of on-site inspection: 02/07/2018 to 10/07/2018				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	**Opening Meeting** ➢ Round of introduction ➢ Scope of Audit ➢ Introduction of Verification Process ➢ confirming focus area for the audit ➢ Final confirmation of audit plan ➢ Attendance Register	Sichuan Rural Energy Office in Chengdu City, Sichuan Province, China	02/07/2018	Li Ziqi, Dai Qinghua
2.	**Interview with PP and CME representative (information included but not limited)** ➢ Information of PoA and included CPAs implementation ➢ The local development of this industry and relevant policy ➢ Technology utilized, Technical equipment and operation ➢ Starting date of PoA and included CPAs and crediting period ➢ Management Procedure and Method taken by CME ➢ Involved personnel and responsibilities ➢ Emission reduction Monitoring Plan and implementation of included CPAs taken by CME for this monitoring period ➢ Sampling Plan and implementation of included CPAs taken by CME for this monitoring period ➢ Training and detailed procedures ➢ Monitoring Data collection and archive procedure and method ➢ Environmental aspects	Sichuan Rural Energy Office in Chengdu City, Sichuan Province, China	02/07/2018	Li Ziqi, Dai Qinghua
3.	**Sites Visit** ➢ Visit randomly selected Households(HHs) to conduct physical inspection to the household digesters in order to verify the monitoring information presented in the monitoring report ➢ Verify whether the PoA implementation is in line with the description in the registered PoA-DD ➢ Verifying whether all the included CPAs were operated as described in the registered PoA-DD and the CPA-DDs ➢ Interview with City and County Level Rural Energy Office representative to verify how they manage the HHs in each CPA and how to collect the monitoring data by sampling method ➢ Interview with HHs, getting relevant information by filling questionnaires to compare with the monitoring data in monitoring report	Randomly selected HHs in Sichuan Province, China	02/07/2018 ~09/07/2018	Li Ziqi, Dai Qinghua
4.	**Documents and Data check (Including but not limited)** ➢ Emission Calculation sheets ➢ Organization Chart of CME and CPA	Sichuan Rural Energy Office in Chengdu City, Sichuan Province, China	10/07/2018	Li Ziqi, Dai Qinghua

	implementer ➢ Monitoring Manual ➢ Operation manual of data management system of the PoA ➢ Sample size calculation spreadsheet ➢ Commission record ➢ Statement on the number of household equipped with biogas digester in this PoA (included CPAs) ➢ Statement on the existing number of household equipped with biogas digester and the number of household included in each CPA ➢ Table of checked and accepted documents for all constructed biogas digesters ➢ Household list that included in each CPA ➢ Sample of manual check and acceptance records of the included CPAs. ➢ Training material copy and training records of the survey staff of this PoA ➢ Comprehensive baseline survey records ➢ Survey list of the 200 samples ➢ Questionnaire paper that filled by the investigated households ➢ The IT system to collect and analyze the monitoring survey data ➢ Sichuan Statistical Yearbook of 2017 ➢ Biogas stove test report			
5.	**Preparation of Findings** ➢ Internal Discussion of verification team	Sichuan Rural Energy Office in Chengdu City, Sichuan Province, China	10/07/2018	Li Ziqi, Dai Qinghua
6.	**Closing Meeting** ➢ Presenting audit findings ➢ Introduce following procedures after site visit	Sichuan Rural Energy Office in Chengdu City, Sichuan Province, China	10/07/2018	Li Ziqi, Dai Qinghua

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	FU	Yinyin	Chengdu Oasis Science & Technology Co., Ltd(CME)/ Project Manager	02/07/2018 ~10/07/2018	• General aspects of the PoA and the CPA • Changes since validation • Monitoring data management; • Quality management system • Sampling method • Data uncertainty and residual risks; • GHG calculation • Procedural aspects of the verification;	Li Ziqi, Dai Qinghua
2.	Zhou	Nanhua	Sichuan Rural Energy Office/ Bureau Chief	02/07/2018	• Project design and implementation • Project related legal	Li Ziqi, Dai Qinghua

3.	Qiu	Yonghong	Sichuan Rural Energy Office/Vice Bureau Chief	02/07/2018, 06/07/2018 ~09/07/2018	issues • Equipment installation and starting of operation • Monitoring plan and Procedures • QA and QC • Training history and records • Data collection and record keeping • Operation and maintenance records • Management system	
4.	Yang	Jiong	Sichuan Rural Energy Office/Section Chief	02/07/2018, 06/07/2018 ~09/07/2018		
5.	Qin	Haodong	Sichuan Rural Energy Office/Staff	02/07/2018 ~10/07/2018		
6.	Yang	Jinsong	Cuiping County Rural Energy Office/Director	02/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
7.	Tang	Shunqiong	Cuiping County Rural Energy Office/Staff	02/07/2018		
8.	Feng	Weidong	Cuiping County Rural Energy Office/ Technician (sampling survey staff)	02/07/2018		
9.	Ma	Yunfu	Tiantai Village, Cuiping County, Yibin City/Household	02/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
10.	Chen	Ming	Tiantai Village, Cuiping County, Yibin City/Household	02/07/2018		
11.	Ma	Bin	Changqing Village, Cuiping County, Yibin City/Household	02/07/2018		
12.	Lin	Zonghai	Changqing Village, Cuiping County, Yibin City/Household	02/07/2018		
13.	Zhong	Kehui	Yibin County Rural Energy Office/ Staff	03/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
14.	Zhao	Ruwen	Yibin County Rural Energy Office/ Technician (sampling survey staff)	03/07/2018		
15.	Zhou	Xianjin	Zhangchang Village, Yibin County, Yibin City/Household	03/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
16.	Xiang	Shujun	Yongsheng Village, Yibin County, Yibin City/Household	03/07/2018		
17.	Ruan	Lihe	Yongsheng	03/07/2018		

			Village, Yibin County, Yibin City/Household			
18.	Liu	Jiaxiong	Daao Village, Yibin County, Yibin City/Household	03/07/2018		
19.	Zhu	Yonghua	Huaqing Village, Yibin County, Yibin City/Household	03/07/2018		
20.	Zuo	Cheng	Yongsheng Village, Yibin County, Yibin City/Household	03/07/2018		
21.	Shen	Tingfu	Wujiao Village, Yibin County, Yibin City/Household	03/07/2018		
22.	Xia	Minjin	Nanxi County Rural Energy Office/ Director	03/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
23	Li	Wen	Nanxi County Rural Energy Office/ Staff	03/07/2018		
24	Dai	Yuancheng	Nanxi County Rural Energy Office/ Technician (sampling survey staff)	03/07/2018		
25	Long	Youkuan	Baihua Village, Nanxi County, Yibin City/Household	03/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
26	Wang	Yongbin	Baihua Village, Nanxi County, Yibin City/Household	03/07/2018		
27	Xiang	Chaodong	Shuikou Village, Nanxi County, Yibin City/Household	03/07/2018		
28	Wang	Jiujin	Shuikou Village, Nanxi County, Yibin City/Household	03/07/2018		
29	Chen	Linchao	Tiantai Village, Nanxi County, Yibin City/Household	03/07/2018		
30	Dai	Xiuquan	Tiantai Village, Nanxi County, Yibin City/Household	03/07/2018		
31	Dai	Gaohai	Dongtang Village, Nanxi County, Yibin City/Household	03/07/2018		
32	Wang	Bangming	Dongtang Village, Nanxi County, Yibin City/Household	03/07/2018		

33	Chen	Rubing	Renshou County Rural Energy Office/ Staff	04/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
34	Liu	Xueru	Renshou County Rural Energy Office/ Staff	04/07/2018		
35	Li	Jianying	Renshou County Rural Energy Office/ Technician (sampling survey staff)	04/07/2018		
36	Xiong	Huaxuan	Guanyin Village, Renshou County, Meishan City/Household	04/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
37	Xiong	Jianhua	Guanyin Village, Renshou County, Meishan City/Household	04/07/2018		
38	Zhang	Jianyun	Fanjia Village, Renshou County, Meishan City/Household	04/07/2018		
39	Zhang	Yulin	Fanjia Village, Renshou County, Meishan City/Household	04/07/2018		
40	Ding	Furong	Dongpo County Rural Energy Office/ Staff	04/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
41	Zhou	Qin	Dongpo County Rural Energy Office/ Director	04/07/2018		
42	Zeng	Libo	Dongpo County Rural Energy Office/ Technician (sampling survey staff)	04/07/2018		
43	Dong	Dezhong	Chengou Village, Dongpo County, Meishan City/Household	04/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
44	Dong	Guanglun	Chengou Village, Dongpo County, Meishan City/Household	04/07/2018		
45	Dong	Guangwei	Chengou	04/07/2018		

			Village, Dongpo County, Meishan City/Household			
46	Chen	Xingcai	Sansu Village, Dongpo County, Meishan City/Household	04/07/2018		
47	Chen	Xingfu	Sansu Village, Dongpo County, Meishan City/Household	04/07/2018		
48	Liu	Chunxue	Sansu Village, Dongpo County, Meishan City/Household	04/07/2018		
49	Hu	Yongzhi	Xinxi Village, Dongpo County, Meishan City/Household	04/07/2018		
50	Ma	Chunlian	Xinxi Village, Dongpo County, Meishan City/Household	04/07/2018		
51	Zha	Haiying	Ziyang City Rural Energy Office/ Director	05/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
52	Yuan	Biqiu	Ziyang City Rural Energy Office/ Staff	05/07/2018		
53	Tang	Li	Lezhi County Rural Energy Office/ Director	05/07/2018		
54	Wu	Hui	Lezhi County Agriculture Bureau/ Bureau Chief	05/07/2018		
55	Chen	Xin	Lezhi County Rural Energy Office/ Technician (sampling survey staff)	05/07/2018		
56	Liu	Bo	Chuanzhumiao Village, Lezhi County, Ziyang City/Household	05/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
57	Lv	Ying	Chuanzhumiao Village, Lezhi County, Ziyang City/Household	05/07/2018		
58	Hu	Yunhua	Nanmugou Village, Lezhi County, Ziyang City/Household	05/07/2018		
59	Hu	Jicheng	Nanmugou Village, Lezhi	05/07/2018		

			County, Ziyang City/Household			
60	Hu	Guoqiong	Nanmugou Village, Lezhi County, Ziyang City/Household	05/07/2018		
61	Liu	Ming	Anyue County Rural Energy Office/ Staff	05/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
62	Pang	Kaiwen	Anyue County Rural Energy Office/ Technician (sampling survey staff)	05/07/2018		
63	Yuan	Wanlun	Dongbacun Village, Anyue County, Ziyang City/Household	05/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
64	Yuan	Wanbing	Dongbacun Village, Anyue County, Ziyang City/Household	05/07/2018		
65	Ma	Huashan	Dongbacun Village, Anyue County, Ziyang City/Household	05/07/2018		
66	Jiang	Shengqian	Fuqucun Village, Anyue County, Ziyang City/Household	05/07/2018		
67	Qing	Chaohu	Fuqucun Village, Anyue County, Ziyang City/Household	05/07/2018		
68	Lei	Guangjun	Tianliucun Village, Anyue County, Ziyang City/Household	05/07/2018		
69	Yang	Zhiqiang	Tianliucun Village, Anyue County, Ziyang City/Household	05/07/2018		
70	Sheng	Jinhua	Mianyang City Rural Energy Office/ Vice Director	06/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
71	Liu	Yun	Mianyang City Rural Energy Office/Section Chief	06/07/2018		
72	Zhang	Quan	Beichuan County Rural Energy Office/ Director	06/07/2018		
73	Chen	Lifu	Beichuan County Rural Energy Office/ Technician (sampling survey staff)	06/07/2018		
74	Mu	Guangyan	Siping Village, Beichuan	06/07/2018	• digester Implementation • live stock type and No.	Li Ziqi, Dai Qinghua

			County, Mianyang City		• which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	
75	Yang	Desheng	Siping Village, Beichuan County, Mianyang City	06/07/2018		
76	Dong	Shaohai	Jingu Village, Beichuan County, Mianyang City	06/07/2018		
77	Dong	Shaozhi	Jingu Village, Beichuan County, Mianyang City	06/07/2018		
78	Dong	Shaowan	Jingu Village, Beichuan County, Mianyang City	06/07/2018		
79	Dong	Yuhua	Jingu Village, Beichuan County, Mianyang City	06/07/2018		
80	Zhang	Daquan	Zitong County Agriculture Bureau/ committee member	07/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
81	Pan	Hongyan	Zitong County Rural Energy Office/ Director	07/07/2018		
82	Yang	Dengshu	Zitong County Rural Energy Office/ Technician (sampling survey staff)	07/07/2018		
83	Jiang	Yicai	Xinhe Village, Zitong County, Mianyang City	07/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
84	Tang	Yue	Xinhe Village, Zitong County, Mianyang City	07/07/2018		
85	Jiang	Tonghua	Shengtian Village, Zitong County, Mianyang City	07/07/2018		
86	Zeng	Weihua	Shengtian Village, Zitong County, Mianyang City	07/07/2018		
87	Dai	Licheng	Shengtian Village, Zitong County, Mianyang City	07/07/2018		
88	Wang	Shunbao	Shengtian Village, Zitong County, Mianyang City	07/07/2018		
89	Jia	Fayuan	Huishui Village, Zitong County, Mianyang City	07/07/2018		
90	Ran	Guangyin	Huishui	07/07/2018		

			Village, Zitong County, Mianyang City			
91	Li	Guifang	Huishui Village, Zitong County, Mianyang City	07/07/2018		
92	Jia	Dingcai	Huishui Village, Zitong County, Mianyang City	07/07/2018		
93	Peng	Huaiju	Honghua Village, Zitong County, Mianyang City	07/07/2018		
94	Hu	Kaiquan	Youxian District Rural Energy Office/ Director	08/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
95	Jia	Youjiang	Guantai Town People Government/ Agriculture Service Center Director	08/07/2018		
96	Xiao	Huaping	Liujia Town Rural Energy Office /Technician (sampling survey staff)	08/07/2018		
97	Yang	Kejin	Guantai Town Rural Energy Office /Technician	08/07/2018		
98	Du	Fafu	Baichan Town Rural Energy Office /Technician (sampling survey staff)	08/07/2018		
99	Yang	Maoqiong	Maoshuisi Village, Youxian District, Mianyang City	08/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
100	Yang	Shirong	Maoshuisi Village, Youxian District, Mianyang City	08/07/2018		
101	Deng	Chaofu	Maoshuisi Village, Youxian District, Mianyang City	08/07/2018		
102	Wang	Yuqun	Maoshuisi Village, Youxian District, Mianyang City	08/07/2018		
103	Zhang	Keqing	Tashuiqiao Village,	08/07/2018		

			Youxian District, Mianyang City			
104	Zeng	Xianfu	Tashuiqiao Village, Youxian District, Mianyang City	08/07/2018		
105	Liu	Fang	Tashuiqiao Village, Youxian District, Mianyang City	08/07/2018		
106	Yang	Yongfu	Tashuiqiao Village, Youxian District, Mianyang City	08/07/2018		
107	Liu	Yuqing	Shihuashan, Village, Youxian District, Mianyang City	08/07/2018		
108	Huang	Jinhua	Shihuashan, Village, Youxian District, Mianyang City	08/07/2018		
109	Tan	Shuqing	Shihuashan, Village, Youxian District, Mianyang City	08/07/2018		
110	Du	Facai	Shihuashan, Village, Youxian District, Mianyang City	08/07/2018		
111	Jia	Qingcong	Duanjiaqiao Village, Youxian District, Mianyang City	08/07/2018		
112	Jia	Anrong	Duanjiaqiao Village, Youxian District, Mianyang City	08/07/2018		
113	Cao	Wenyuan	Duanjiaqiao Village, Youxian District, Mianyang City	08/07/2018		
114	Chen	Gang	Anzhou District Rural Energy Office /Director	09/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
115	Liu	Hong	Anzhou District Rural Energy Office /Section Chief	09/07/2018		
116	Li	Gangfei	Anzhou District Rural Energy Office /Section	09/07/2018		

			Chief			
117	Zhao	Xianhua	Anzhou District Rural Energy Office /Technician (sampling survey staff)	09/07/2018		
118	Li	Qiwu	Chaoyang Village, Anzhou District, Mianyang City	09/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
119	Li	Qiyin	Chaoyang Village, Anzhou District, Mianyang City	09/07/2018		
120	Wang	Dacheng	Chaoyang Village, Anzhou District, Mianyang City	09/07/2018		
121	Li	Shengyu	Tongqiao Village, Anzhou District, Mianyang City	09/07/2018		
122	Xu	Daozhen	Tongqiao Village, Anzhou District, Mianyang City	09/07/2018		
123	Lei	Jia	Chengdu City, Jianyang District Rural Energy Office /Section Chief	09/07/2018	• How to manage the included households • How to monitor the CPA and collect the data from sampling • Training	Li Ziqi, Dai Qinghua
124	Wang	Chunhua	Chengdu City, Jianyang District Rural Energy Office /Staff	09/07/2018		
125	Zhou	Hong	Chengdu City, Jianyang District Rural Energy Office /Technician (sampling survey staff)	09/07/2018		
126	Jiang	Zengcui	Miaoshancun Village, Jianyang District, Chengdu City	09/07/2018	• digester Implementation • live stock type and No. • which enter in digester • days of digester use • sludge utilization way • fuel type and consumption quantity in baseline and project scenario	Li Ziqi, Dai Qinghua
127	Zhou	Xuwu	Miaoshancun Village, Jianyang District, Chengdu City	09/07/2018		
128	Tang	Shijiu	Miaoshancun Village, Jianyang District,	09/07/2018		

			Chengdu City			
129	Li	Tongshui	Changshuncun Village, Jianyang District, Chengdu City	09/07/2018		
130	Li	Yuqing	Changshuncun Village, Jianyang District, Chengdu City	09/07/2018		
131	Guo	Gaiai	UPM Umwelt-Projekt-Management GmbH/Vice Manager	02/07/2018 ~10/07/2018	• Sampling method • Data uncertainty and residual risks; • GHG calculation	Li Ziqi, Dai Qinghua

D.4. Sampling approach

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In this monitoring period (01/01/2016-31/12/2016), there are 87 CPAs including 395,435 households in this PoA via checking the MR against the latest approved CPA DDs[/10-13/]. All the households are located in Sichuan province, which is a limited area. Simple random sampling approach was selected for this PoA due to relatively homogenous population being studied, given the similar average ambient temperature and similar living habit of residents in Sichuan. Therefore, simple random sampling (SRS) approach was followed by the PP to determine the sample size, and it is able to confirm the selection of sampling approach is appropriate as per verification team's local knowledge. Target population is defined as all the households included in the PoA, i.e. 395,435 households in all included CPAs.

As per the applied methodologies and latest approved PoA-DD and CPA-DDs, a single sample was drawn by the PP from the monitoring database in line with the Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities (hereafter can be referred to as the 'sampling guideline'). According to the applied methodologies, confidence/precision of 90/10 is acceptable for sampling. According to the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, confidence/precision of 95/10 should be applied when the sampling plan covered a group of CPAs. For this PoA, confidence/precision is determined as 95/10. Therefore, it is able to confirm that the selection of confidence/precision is appropriate by verification team.

According to the methodologies applied and latest approved PoA-DD and CPA-DDs, sampling approach is applied for the monitoring parameters:

- $FC_{m,j}$ - Annual consumption of fossil fuel type *j* coal (physical units, mass/volume) by application *m*;
- $n_{k,y}$ - Proportion of $N_{k,0}$ that remain operating at year *y* (fraction);
- $N_{m,y}$ - Number of thermal application *m* remaining in use in year *y*;
- *t* - Mean annual operation hours of the digesters;
- $N_{LT,y}$ - Annual average number of animals of type *LT* in year *y* (numbers);
- $MS\%_{i,y}$ - Fraction of manure handled in project animal manure management system *i* (i.e. digestion in the newly installed biogas digester);
- Proper sludge application ratio - Land application of digestate from biogas digesters to avoid anaerobic digestion;

The sample size of the PoA considering the parameters is calculated in a conservative way, and the least number of the sample size is 139 for two different methodology combinations. The CME chose 200 for conservation as the same. Details for identify the sample size can be referred below.

Sampling Method

The unbiased estimation of total value and mean value are:

$$\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i \qquad (E\text{-}1)$$

$$p = \frac{a}{nm} \qquad (E\text{-}2)$$

The unbiased variation estimators of $V(\bar{y})$ and $V(p)$ with a sufficiently small *f* are:

$$v(\bar{y}) = \frac{1-f}{n}s^2 = \frac{1-f}{n(n-1)}\sum_{i=1}^{n}(y_i - \bar{y})^2 \approx \frac{1}{n(n-1)}\sum_{i=1}^{n}(y_i - \bar{y})^2 \qquad (E\text{-}3)$$

$$v(p) = \frac{1-f}{n-1}p(1-q) \approx \frac{1}{n-1}p(1-q) \qquad (E\text{-}4)$$

Relative error of the sample is to be calculated by formula:

$$r = t_{0.05}\frac{\sqrt{v(\bar{\bar{y}})}}{\bar{\bar{y}}} \qquad (E\text{-}5)$$

Where:

n	*Sample size*
f	*Sampling fraction*
N	*Total size of population*
s	*Standard error*
v	*Variation of Sample*
y_i	*Observation of a sample household*
$\bar{y}$	*Mean value of sample*
p	*Proportion of the sample*
q	*Equals to 1-p*
r	*Relative error. Default is 10%.*
$t_{0.05}$	*1.96*

Sampling Size Calculation

Sample size calculation is based on the formulas below as defined in Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities for the simple random sampling approach adopted.

Step 1*: Confidence/precision*

The proposed PoA adopts the methodologies AMS-I.I. and AMS-III.R. It is defined in *Standard For Sampling And Surveys For CDM Project Activities And Programme Of Activities, version 4* that a confidence/precision of 95/10 should be used if one survey covers several CPAs. Since this is the highest confidence/precision mentioned in the applied methodologies and standards, these values shall be used for the sample size calculation.

Step 2*: Initial Sample size*

(i) For mean value, the following formula is to calculate the initial sample size n_0:

$$n_0 = \frac{t^2 S^2}{r^2 \bar{Y}^2} \quad (E\text{-}6)$$

To determine population parameter S^2 and $\bar{Y}^2$, the following options can be taken: (a) taking a small scale SRS pre-survey, or (b) reference of similar survey, or (c) double sampling scheme.

Where,

S	*Standard error of sample*
$\bar{Y}$	*Mean value of sample*
r	*Relative error. Default is 10%.*
$t_{0.05}$	*1.96*

(ii) For proportion, initial sample size n_0 can be calculated by formula:

$$n_0 = \frac{t^2 Q}{r^2 P} \quad (E\text{-}7)$$

Where,

P	*Proportion of sample*
Q	*Q=1-P*
r	*Relative error. Default is 10%.*
$t_{0.05}$	*1.96*

***Step 4**: Other considerations of sample size*

Sample size should be corrected according to the size of target population N by formula:

$$n_1 = \frac{n_0}{1 + \frac{n_0}{N}} \quad (E\text{-}8)$$

Then, be corrected Respond Rate r_R (initially 90%) by formula:

$$n_2 = \frac{n_1}{r_R} \quad (E\text{-}9)$$

In case, the survey covers more than one expected parameters, conservatively, sample size n should not be less than the maximum calculated sample size of those indicators.

$$n \geq max(n_2^1, n_2^2, \ldots, n_2^n) \quad (E\text{-}10)$$

For mean value parameters,

To determine population parameter S^2 and $\bar{Y}^2$, a small scale SRS pre-survey for this PoA was conducted in Apr 2011 by Sichuan Rural Energy Office and had statistical analysis by C/ME. Via checking the survey record/62/, it is confirmed that a small group of 30 households with installed biogas digesters are randomly selected to investigate the annual operation hours of biogas system, annual average pig numbers, sludge application rate and rate of digesters still in operation. Through visiting each sampled household/62/, it is concluded that the following parameters are estimated (for the application of equation E-6) for sampling the parameter of Annual average number of pigs in year y and the Mean annual operation hours of the digesters:

Annual average number of pigs in year y ($N_{LT,y}$): Mean: $\bar{Y}$ =5 pigs; Standard Deviation: S=3 pigs

Mean annual operation hours of the digesters (t): Mean $\bar{Y}$ =8,400 h; Standard Deviation: S=1,200 h

Using these values and equation E-6 the sampling sizes for these two parameters are calculated as:

Annual average number of pigs in year y ($N_{LT,y}$) : $$n \geq \frac{t^2 SD^2}{0.1^2 mean^2} = \frac{1.96^2 \times 3^2}{0.1^2 \times 5^2} = 138.3$$

Mean annual operation hours of the digesters (t): $$n \geq \frac{t^2 SD^2}{0.1^2 mean^2} = \frac{1.96^2 \times 1200^2}{0.1^2 \times 8400^2} = 7.84$$

Therefore, sample size for the mean annual operation hours of the digesters (t) should be 8, while the same for the Annual average number of pigs in year y ($N_{LT,y}$) should be 139.

For proportional parameters,

Via checking the small scale SRS pre-survey record/62/, it is confirmed that 24 households have aerobic sludge application and in operation, the proportional parameters (sludge application rate and rate of digesters still in operation) have P=0.8 (24/30), thus Q=1-P=0.2.
Hence, for sampling of Fraction of manure handled in project animal manure management system i, Proportion of $N_{k,0}$ that remain operating at year y and Proper sludge application ratio - Land application of digestate from biogas digesters to avoid anaerobic digestion, the following parameters are estimated (for the application of equation E-7):

Proper sludge application ratio: $$n \geq \frac{t^2(1-p)}{0.1^2 P} = \frac{1.96^2 \times (1-0.8)}{0.1^2 \times 0.8} = 96.04$$

Fraction of manure handled in project animal manure management system i: $$n \geq \frac{t^2(1-p)}{0.1^2 P} = \frac{1.96^2 \times (1-0.8)}{0.1^2 \times 0.8} = 96.04$$

Proportion of $N_{k,0}$ that remain operating at year y $$n \geq \frac{t^2(1-p)}{0.1^2 P} = \frac{1.96^2 \times (1-0.8)}{0.1^2 \times 0.8} = 96.04$$

Therefore, sample size for the 3 parameters should be greater than 97.

Via checking the Sample size calculation spreadsheet/16/, it is confirmed that the sample size for both mean value parameters and proportional parameters are calculated as per the Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities and the result was recalculated by the verification team to be confirmed as correct.

As a conservative approach, a sample size of 200 was chosen by the CME, which is bigger than all calculated minimum sampling sizes, i.e 139 and 97. A Monitoring Survey list of the 200 samples/17/ was supplied by the CME, which was compiled base on the Table of checked and accepted documents/19/ done by the survey staff. In the Survey list, name of household, digester ID, location, operation status of each biogas digester, operation days and stop days of each biogas digester, sludge utilization, monthly and annual average pig numbers, coal and other fossil fuel consumption etc. were monitored and recorded. Via interview with the CME and survey staff, it is confirmed that 200 households are randomly selected from the 395,435 households list by the simple random sampling (SRS) method. The excel function “randbetween” is employed to choose the households sample group. The CME distributed the survey to local Rural Energy Offices, then the survey team of each town visited the households in the project sample group and collected data with the questionnaires.

The verification team checked the adoption of sampling size calculation equations and parameter calculation process of the monitoring parameters that applied with sampling approach. It is able to confirm that the sampling approach was consistent with the latest EB requirements. Sampling type was properly selected, the required confidence/precision has been met, and the sampling size was corrected calculated, so that the selected samples were representative of the population.

Reliability Analysis

As a conservative approach, a sample size of 200 was chosen by the CME. In the monitoring report and relevant parameters were monitored and recorded. Reliability of the sample size was calculated by the CME. For the mean operation hours of each digester (*t*), standard error is calculated as 1.06%; for the annual average number of pigs ($N_{LT,y}$), standard error is calculated as 7.33%; for the annual consumption of fossil fuel type *j* coal (physical units, mass/volume) by application m ($FC_{m,j}$), standard error is calculated as 7.50%, respectively under the confidence level of 95%. All of them are below 10%. For the proportional parameters (Proper sludge application ratio), 100% sludge of each sampled digester has been applied in land application to avoid methane emissions; all the manure generated has been fed into biogas digesters directly ($MS\%_{i,y}$); 199 of all sampled 200 households digesters and biogas stoves have been inspected that 99.5% in operation ($n_{k,y}$), all 200 sampled households have coal stoves in use, in this case, the total number of coal stoves in use for all 87 CPAs in the monitoring period is 395,435 ($N_{m,y}$).

Via checking the Survey list of the 200 samples/17/, it is confirmed that the standard errors above are correctly calculated under the confidence level of 95%. Thus the monitoring of these parameters have met the confidence/precision of 95%/10%. Therefore, the sample size is reliable.

The verification team reviewed the MR, PoA-DD and included CPA-DDs, the other available data and documents such as the Survey list of the 200 samples/17/, the questionnaire papers/18/ filled by the households, and Table of checked and accepted documents/19/. Crosschecked with the inspection during the on-site period, including 85 random households visit. Verified whether the sample plan is reasonable to conduct and the implementation and results of the sample survey can be accepted.

Acceptance of Sampling

Using own professional judgement, it is assumed that the Acceptable Quality Level (AQL) is 1% and the Unacceptable Quality Level (UQL) is 10% for this PoA. The maximum error of producer's risk and consumer's risk is assumed at 5%, in compliance with the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities (hereafter referred to as the "sampling standard"). Based on these assumptions, the verification team refers to the sampling standard and sampling guideline and found that sample size should be not less than 61 and acceptance number is 2. To be more conservative, before the on-site visit, CTI determined 85 as the sample size and randomly selected 50 from the survey list of the 200 samples, and randomly selected 35 from the Household list of 87 CPAs exclude 200 samples selected by CME. For the randomly selection of 50, a pre-randomized order of numbers ranging from 1-200 as calculated by Excel's RAND() function was brought to the field and a household list prepared in the field. If for example, the first number is 5, then the household name that was listed 5th on the household list would be the one to be surveyed.
For the randomly selection of another 35, a pre-randomized order of numbers ranging from 1-395,235 (395,435-200) as calculated by Excel's RAND() function was brought to the field and a household list prepared in the field. If for example, the first number is 10, then the household name that was listed 10th on the household list would be the one to be surveyed.

During on-site visit, 85 households (total sample size) were chosen by the verification team randomly to check the correctness of sampling size and data that need to be monitored. This is considered to be a good practice.

Parameter	Number of samples in MR	Number of samples by verification team	Acceptance number	Discrepant records	Acceptable or not
Annual consumption of fossil fuel type *j*	200	85	2	1	Yes

coal (physical units, mass/volume) by application m ($FC_{m,j}$)					
Proportion of $N_{k,0}$ that remain operating at year y (fraction) ($n_{k,y}$)	200	85	2	0	Yes
Number of thermal application m remaining in use in year y ($N_{m,y}$), m refers to coal stove	200	85	2	0	Yes
Mean annual operation hours of the digesters (t)	200	85	2	0	Yes
Annual average number of animals of type LT in year y ($N_{LT,y}$)	200	85	2	2	Yes
Fraction of manure handled in project animal manure management system i (i.e. digestion in the newly installed biogas digester)	200	85	2	0	Yes
Land application of digestate from biogas digesters to avoid anaerobic digestion (Proper sludge application ratio)	200	85	2	0	Yes

As per the above table, for the parameter "Proportion of $N_{k,0}$ that remain operating at year y (fraction) ($n_{k,y}$)", "Mean annual operation hours of the digesters (t)", "Fraction of manure handled in project animal manure management system i (i.e. digestion in the newly installed biogas digester)", "Land application of digestate from biogas digesters to avoid anaerobic digestion (Proper sludge application ratio)" result of CME's is consistent in the samples verified (cross-checked) by the verification team. For the parameters "Annual consumption of fossil fuel type j coal (physical units, mass/volume) by application m ($FC_{m,j}$)" and "Annual average number of animals of type LT in year y ($N_{LT,y}$)", 2 minor discrepancies are found separately as table shown below.

Parameter	PoA Unique No. of Household	Result from CME	Result from Verification team
Annual consumption of fossil fuel type j coal (physical units, mass/volume) by application m ($FC_{m,j}$)	"Mianyang-Youxian-IFAD2010-12041"	0.025 t	0 t
Annual average number of animals of type LT in year y ($N_{LT,y}$)	"Mianyang-Zitong-D10-06989"	4.17	6
	"Mianyang-An-2010 Investment in rural biogas projects within the central budget 05589"	4	6

In all, it is observed that the number of discrepant records is less than or equal to the acceptance number. Therefore, in accordance with paragraph 28 and 32 of the sampling standard[41], it is able to confirm that the sample size and sampling result is acceptable.

To make sure the data would be well collected during on-site sampling, survey staffs were well trained before they start the collecting work. A copy of training material and training records/21/ were reviewed and verified by the verification team. Photos of the training courses/21/ were also supplied and it is able to confirm that the survey staffs were well trained before start working. When the survey staffs went to the households, questionnaire papers/18/ were supplied to the households and households are required to answer the questions on the questionnaire papers. After the questionnaire papers were filled, both survey staff and the households signed on the questionnaire papers. After all the households filled in such questionnaire papers, survey staff were required to fill a table, on which general information of each household are clearly included. Then the table were checked and confirmed by the SREO. The questionnaire papers/18/ and Table of checked and accepted documents/19/ were well preserved and supplied to the verification team during on-site verification.

The verification team has checked the questionnaire papers filled by the household users, table of checked and accepted documents, survey list of the 200 samples summarized by the CME. Furthermore, during on-site verification, the verification team has interviewed 13 survey staffs who conducted the sampling survey and confirmed that the survey was conducted based on the sampling plan and via checking the signatures of the survey staffs between the 200 questionnaire papers and on-site CTI form of personnel interviewed, it is confirmed that the signatures of the survey staffs are consistent. The verification team is able to confirm that the sampling process is reliable.

To ensure the data used in the calculation are correct, a QA/QC procedure was established by the CME including Supervisor Check, Data Entry, Data Check Algorithms and Analytical Checks.

Step 1: Supervisor Check
When the monitoring data was collected, the supervisor of the county reviewed all the questionnaires collected from each interviewer. Data on the questionnaires need to be subject to five kinds of checks: range checks (outlier data), checks against reference data, skip checks, consistency checks and typographic checks.

Step 2: Data Entry
A data entry program should be used with suspect range and logical consistency triggers. One simple solution is to set up a spreadsheet data entry template with validity check triggers.

Step 3: Data Check Algorithms
Project data management software was used to check for the inconsistencies, missing values, identification numbers, double data entry. One simple solution is to use sort and filter function of spreadsheet.

Step 4: Analytical Checks:
By basic descriptive statistics, the outliers could be easily figured out. Further statistical analysis can work more characteristics of the data by professional analysis tools.

The monitoring sampling data, both hard and soft copy, are stored carefully by CME within the whole crediting period. Two hardcopies of monitoring questionnaires need to be stored in CME offices in Beijing and Chengdu separately to avoid information missing. Via checking the data management procedure and archive records, the verification team is able to confirm that the QA/QC procedure is in place and working properly.

Conclusion

Based on the document review and on-site visit interviews, the verification team verifies that the registered monitoring plan is implemented as planned and confirms that the operational and management system is implemented as per the registered monitoring plan.
During the on-site visit the verification team was able to verify that monitoring organization structure and data collection procedure is in line with monitoring plan of the latest approved/included CPA-DDs and monitoring report. Moreover, the verification team has interviewed the 13 personnel who are working on the data collection and management and 85 household users that were randomly

selected. The verification team verified certain documents, like Questionnaire papers that filled by the investigated households/18/, Table of checked and accepted documents for all constructed biogas digesters signed by local authority/19/, Survey list of the 200 samples/17/, Household list that included in each CPA (from CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087)/28/, and Statement on the number of household equipped with biogas digester in this PoA (from CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087)/26/. A monitoring mechanism which was established by the CME was found to be in place and working properly. Survey staffs were well trained/21/ before start working and a data management system were established for data management. QA/QC procedure was established to avoid misuse of invalid data.

It was verified that authorities and responsibilities for monitoring and reporting of all data related to the emission reductions were clearly defined for this monitoring period. Moreover, the biogas digesters in all the CPAs included in the PoA during this monitoring period were properly installed with the help of technicians/26-28/. Operation data were collected by well trained survey staff/21/. The frequency of monitoring, measurement, as well as reporting details were conducted as outlined in the monitoring plan available in the latest version of the CPA-DDs/10-13/.

D.5. Clarification requests, corrective action requests and forward action requests raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
General			
Compliance of the monitoring report with the monitoring report form	1	1	-
Remaining forward action requests from validation and/or previous verification	-	-	-
CPA(s) considered for verification and covered in this report	-	-	-
Programme of activities			
Compliance of the programme implementation with the registered PoA-DD	-	-	-
Implementation and operation of the management system	-	-	-
Post-registration changes	-	-	-
• Temporary deviations from the registered monitoring plan, applied methodology or applied standardized baseline	-	-	-
• Corrections	-	1	-
• Inclusion of a monitoring plan	-	-	-
• Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline or other applied standards or tools	-	-	-
• Changes to the programme design or project design	-	-	-
• Change of coordinating/managing entity	-	-	-
• Changes specific to afforestation and reforestation activities	-	-	-
Component project activities			
Compliance of the CPA implementation with the included CPA design document	1	-	-
Post-registration changes	-	-	-
• Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline	-	-	-
• Corrections	-	-	-
• Changes to the start date of the crediting period of component project activities	-	-	-
• Inclusion of a monitoring plan	-	-	-
• Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline or other applied standards or tools	-	-	-
• Changes to the programme design of project design	-	-	-
• Changes specific to afforestation and reforestation component project activities	-	-	-
Compliance of the registered monitoring plan with the methodology including applicable tool(s) and standardized baseline	-	1	-
Compliance of monitoring activities with the registered monitoring plan	-	-	-
• Data and parameters fixed ex ante or at renewal of crediting period	-	-	-
• Data and parameters monitored	2	5	-
• Implementation of sampling plan	1	1	-
Compliance with the calibration frequency requirements for measuring instruments	-	-	-

Assessment of data and calculation of emission reductions or net removals	-	-	-
• Calculation of baseline GHG emissions or baseline net GHG removals by sinks	-	1	-
• Calculation of project GHG emissions or actual net GHG removals by sinks	-	1	-
• Calculation of leakage GHG emissions	-	-	-
• Summary of calculation of GHG emission reductions or net GHG removals by sinks	-	1	-
• Comparison of actual GHG emission reductions or net GHG removals by sinks with estimates in included CPA	-	-	-
• Remarks on difference from estimated value in included CPA	-	1	-
Assessment of reported sustainable development co-benefits	-	-	-
Global stakeholder consultation	-	-	-
Others (please specify)	-	-	-
Total	**5**	**13**	**0**

SECTION E. Verification findings

E.1. General

E.1.1. Compliance of the monitoring report with the monitoring report form

Means of verification	According to para 337 &338 of VVS for PoA version 01.0, the verification team crosschecked and compared the MR by employing the valid version of the applicable monitoring report form listed in UNFCCC website. - The MR used the latest valid version of the applicable at UNFCCC website. - The MR is completed and meets all relevant requirements of instructions for filling out the Monitoring Report Form (version 02.0) for CDM programme activity.
Findings	**CL 01** **CAR 01** (Refer to Appendix 4)
Conclusion	CL 01 and CAR 01 are closed. Refer to Appendix 4 for findings' resolution. As per requirement of VVS for PoA Version 01.0, based on the findings above, it is confirmed that the MR version 2 was in compliance with relevant valid version of monitoring report form and instructions therein for filling out MR.

E.1.2. Remaining forward action requests from validation and/or previous verifications

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This is the 5th periodic verification of the PoA. There is no FAR from previous verifications via checking the previous verification reports/52-55/.

E.1.3. CPAs considered for verification and covered in this report

Title and UNFCCC reference number of the CPA included in the PoA as of the end of this monitoring period	Is the CPA considered for this verification? (yes/no)	The date when the CPA was included	Version of the PoA-DD	Confirmation that a request for issuance including the CPA has been published for the previous monitoring period (Y/N)
2898-0001	Yes	11/04/2012	2	Y
2898-0002	Yes	11/04/2013	2	Y
2898-0003	Yes	11/04/2013	2	Y

2898-0004	Yes	11/04/2013	2	Y
2898-0005	Yes	11/04/2013	2	Y
2898-0006	Yes	11/04/2013	2	Y
2898-0007	Yes	11/04/2013	2	Y
2898-0008	Yes	11/04/2013	2	Y
2898-0009	Yes	11/04/2013	2	Y
2898-0010	Yes	11/04/2013	2	Y
2898-0011	Yes	11/04/2013	2	Y
2898-0012	Yes	11/04/2013	2	Y
2898-0013	Yes	11/04/2013	2	Y
2898-0014	Yes	11/04/2013	2	Y
2898-0015	Yes	11/04/2013	2	Y
2898-0016	Yes	11/04/2013	2	Y
2898-0017	Yes	11/04/2013	2	Y
2898-0018	Yes	11/04/2013	2	Y
2898-0019	Yes	11/04/2013	2	Y
2898-0020	Yes	11/04/2013	2	Y
2898-0021	Yes	11/04/2013	2	Y
2898-0022	Yes	11/04/2013	2	Y
2898-0023	Yes	11/04/2013	2	Y
2898-0024	Yes	11/04/2013	2	Y
2898-0025	Yes	11/04/2013	2	Y
2898-0026	Yes	11/04/2013	2	Y
2898-0027	Yes	11/04/2013	2	Y
2898-0028	Yes	11/04/2013	2	Y
2898-0029	Yes	11/04/2013	2	Y
2898-0030	Yes	11/04/2013	2	Y
2898-0031	Yes	11/04/2013	2	Y
2898-0032	Yes	11/04/2013	2	Y
2898-0033	Yes	11/04/2013	2	Y
2898-0034	Yes	11/04/2013	2	Y
2898-0035	Yes	11/04/2013	2	Y
2898-0036	Yes	11/04/2013	2	Y
2898-0037	Yes	11/04/2013	2	Y
2898-0038	Yes	11/04/2013	2	Y
2898-0039	Yes	11/04/2013	2	Y
2898-0040	Yes	11/04/2013	2	Y
2898-0041	Yes	11/04/2013	2	Y
2898-0042	Yes	11/04/2013	2	Y
2898-0043	Yes	11/04/2013	2	Y
2898-0044	Yes	11/04/2013	2	Y
2898-0045	Yes	11/04/2013	2	Y
2898-0046	Yes	11/04/2013	2	Y
2898-0047	Yes	11/04/2013	2	Y
2898-0048	Yes	11/04/2013	2	Y
2898-0049	Yes	11/04/2013	2	Y
2898-0050	Yes	11/04/2013	2	Y
2898-0051	Yes	11/04/2013	2	Y
2898-0052	Yes	11/04/2013	2	Y
2898-0053	Yes	11/04/2013	2	Y
2898-0054	Yes	24/03/2014	2	Y
2898-0055	Yes	24/03/2014	2	Y
2898-0056	Yes	24/03/2014	2	Y
2898-0057	Yes	24/03/2014	2	Y
2898-0058	Yes	24/03/2014	2	Y

2898-0059	Yes	24/03/2014	2	Y
2898-0060	Yes	24/03/2014	2	Y
2898-0061	Yes	24/03/2014	2	Y
2898-0062	Yes	24/03/2014	2	Y
2898-0063	Yes	24/03/2014	2	Y
2898-0064	Yes	24/03/2014	2	Y
2898-0065	Yes	24/03/2014	2	Y
2898-0066	Yes	24/03/2014	2	Y
2898-0067	Yes	24/03/2014	2	Y
2898-0068	Yes	24/03/2014	2	Y
2898-0069	Yes	24/03/2014	2	Y
2898-0070	Yes	24/03/2014	2	Y
2898-0071	Yes	24/03/2014	2	Y
2898-0072	Yes	24/03/2014	2	Y
2898-0073	Yes	24/03/2014	2	Y
2898-0074	Yes	29/01/2015	2	Y
2898-0075	Yes	29/01/2015	2	Y
2898-0076	Yes	29/01/2015	2	Y
2898-0077	Yes	29/01/2015	2	Y
2898-0078	Yes	29/01/2015	2	Y
2898-0079	Yes	29/01/2015	2	Y
2898-0080	Yes	29/01/2015	2	Y
2898-0081	Yes	29/01/2015	2	Y
2898-0082	Yes	29/01/2015	2	Y
2898-0083	Yes	29/01/2015	2	Y
2898-0084	Yes	29/01/2015	2	Y
2898-0085	Yes	29/01/2015	2	Y
2898-0086	Yes	29/01/2015	2	Y
2898-0087	Yes	29/01/2015	2	Y

E.2. Programme of activities

E.2.1. Compliance of the programme implementation with the registered programme design document

Means of verification	According to VVS version for PoA 01.0, CTI conducted an on-site inspection (02/07/2018-10/07/2018)[58] to assess that all physical features (technology, project equipment, and monitoring procedures) of the included CDM CPA in the registered PoA-DD and CPA-DDs are in places and the CME have operated the PoA as per the PoA-DD. It was found that: The PoA aims to reduce a large amount of greenhouse gases (GHG) by facilitating the installation of a large number of household biogas digesters for the low-income households located in Sichuan province, P. R. China. During this 5th monitoring period 01/01/2016 – 31/12/2016, 87 CPAs were included and 395,435 households were equipped with the biogas digesters in Yibin, Neijiang, Suining, Ziyang, Zigong, Luzhou, Leshan, Meishan, Mianyang, Guang'An, Ganzi, Aba and Dazhou, all of which are located in Sichuan province. In this monitoring period quantities of the included CPAs and households are not changed. Prior to the project activity, households in the area which are now covered by PoA stored animal manure produced by micro-scale animal husbandries in deep pits for several months before applying it to their farmland. In the meantime, coal was used as source of energy for cooking in daily life. This is the baseline scenario. Through the project activity, each household is equipped with a household biogas digester that treats the manure anaerobically and recovers the generated methane as energy supply, which will avoid methane emission and reduce coal consumption. The Sichuan Rural Energy Office (SREO) is the local authority while Chengdu Oasis Science & Technology Co., Ltd. is the coordinating/managing entity (CME), who will take the entire task regarding the monitoring issues. Based on the previous

	verification and during on-site inspection, the verification team checked the Table of checked and accepted documents[/19/] and statement on the household number and operation date issued by the SREO[/26/] and is able to confirm that the local authority and CPAs implementer is SREO, CME is the Chengdu Oasis Science & Technology Co., Ltd, taking care of all investigation and monitoring data review work. During this monitoring period, a new statement on the existing total household number[/27/] as well as the number included in each CPA were issued by the SREO. In the statement, SREO confirmed that in this monitoring period the number of included CPAs and included households was not changed (same as the previous monitoring period). Moreover, during the on-site verification a full list of the households equipped with biogas digesters were verified by verification team, on which name, digester ID, digester location, and construction date were clearly indicated. Table of checked and accepted documents for all constructed biogas digesters[/19/] were also randomly checked and it is able to confirm it is accepted by the local authority. Through checking above mentioned documents, the verification team is able to confirm that the total number of household equipped with biogas digester is 395,435 and the households included in each CPA are not changed, which is consistent with the monitoring report. The verification team also checked construction time of all the digesters on the Household list[/28/] that included in each CPA (from CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087) and confirmed that the earliest construction date of CPA Nb. SCHHBG-2010-001 is 10/12/2010, which is consistent with the latest approved CPA-DDs[/10/]. The verification team also checked the Household list of CPA Nb. SCHHBG-2012-002 to CPA Nb. SCHHBG-2013-073[/11-12/] and confirmed that the earliest construction date of biogas digester is no earlier than 28/10/2010. It is consistent with the CPA-DDs of CPA Nb. SCHHBG-2012-002 to CPA Nb. SCHHBG-2013-073[/11-12/]. The verification team also checked the Household list of CPA Nb. SCHHBG-2014-074 to CPA Nb. SCHHBG-2014-087[/13/] and confirmed that the earliest construction date of biogas digester is no earlier than 29/10/2010. It is consistent with the CPA-DDs of CPA Nb. SCHHBG-2014-074 to CPA Nb. SCHHBG-2014-087[/13/]. Construction of all CPAs (from CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087) finished and started operation before 04/09/2014[/10-13/]. Verification team checked the Household list that included in each CPA and able to confirm the information on construction date given in the MR is correct. During on-site visit, the verification team checked the biogas digesters equipped in each sampled household. Each biogas digester system consists of components such as inlet, inlet pipe, fermentation chamber, gas chamber storage, hydraulic chamber, movable cover and gas tube. Verification team is able to confirm that the systems were equipped in line with the registered PoA-DD and CPA-DD. The digesters were designed according to relevant regulations, checked and accepted by local authority[/19/]. Therefore, based on this on-site visit and the reviewed project documentation, the verification team confirms that the realized technology, the project equipment, included CPA and household number, as well as the CME name/responsibility are consistent with the description in the registered or included CPA-DDs. There is no information (data and variables) provided in the monitoring report that is different from that stated in the registered PoA-DD and CPA-DD.
Findings	N/A
Conclusion	According to para 339 &341 of VVS for PoA version 01.0, it is confirmed that the implementation and operation of the PoA and included CPAs has been conducted in accordance with the description contained in the latest approved PoA-DD and CPA-DDs; There is no deviation or the proposed or actual changes in the implementation or operation of the PoA and CPA comply with the requirements of the Project standard. All physical features (technology, project equipment, and monitoring procedures) of the included CPAs specified in the included CPA-DDs are in place and that the CME has operated the registered CDM PoA and included CPAs as per the latest approved PoA-DD and CPA-DDs.

E.2.2. Implementation and operation of the management system

Means of verification	According to VVS for PoA version 01.0, the verification team conducted documents review and on-site interview to assess implementation and operation of the management system included CDM CPA in the PoA are consistent with the latest approved PoA-DD and CPA-DDs. To make sure the monitoring procedure working properly, a monitoring structure was established. Two organizations were working on the monitoring ➢ Work of this PoA. SREO is local authority and CPAs implementer, Chengdu Oasis Science & Technology Co., Ltd is CME, and in charge of all tasks related to CDM and PoA, including determining the households to be included in the sampling survey using a simple random approach, submits the household references to the local data collectors, and the whole process of data management. ➢ The data collection and management process are operated as below: i. A central online platform was established and the CME could use the platform to determine the households to be included in the sampling using a simple random approach and submits the household references to the local data collectors. ii. Well trained local officers of SREO visited the households. Data collected was uploaded to the platform after the site visit. Using this platform, data could be transferred back to the CME for the calculation of the emission reduction. iii. Data collected would be then analysed by an automatic database system, and outcome of the sampling survey would be used to calculate the emission reduction of each CPA during a certain monitoring period. Monitoring report could be prepared base on the data acquired. During on-site inspection, data management system was checked by the verification team. Operation manual of the data management system was supplied to the verification team[/24/]. Therefore, it is able to confirm that the data management system was properly designed and operated, and operation manual was well followed. Both platforms, the web-interface for the local data collectors as well as the emission reduction calculation software are saved in a backup system regularly, it is able to confirm that all data acquired within this data recording system will be kept at least until two years after the end of the crediting period of the PoA. This is verified by on-site inspection.
Findings	N/A
Conclusion	In conclusion, based on document review, and stakeholder interview, together based on verification team's local and sectoral expertise, it is confirmed that: The implementation and operation of the management system included in the latest approved PoA-DD and CPA-DDs are consistent with the actual PoA implementation and operation situation.

E.2.3. Post-registration changes

E.2.3.1. Temporary deviations from the registered monitoring plan, applied methodology or applied standardized baseline

>>
N/A

E.2.3.2. Corrections

>>

- **Corrections that have been approved prior to this monitoring period;**
  A correction was made for CPA 2898-0002 to CPA 2898-0053 during the first verification on the monitoring period (10/05/2012 – 05/06/2013).
  PRC reason: The parameter $FC_{BL,y}$ and $FC_{PE,y}$ in the CPA-DDs of CPA 2898-0002 to CPA 2898-0053 should be the total coal consumption before and after installation for all the households in the entire CPA, but it was wrongly indicated as the average coal consumption per household in the original registered CPA-DDs. Therefore, a correction in the CPA-DDs of

2898-0002 to 2898-0053 was made, the value of $FC_{BL,y}$ and $FC_{PE,y}$ was corrected as the absolute coal consumption in the entire CPA.
And the correction as a post-registration change was approved on 03/01/2014.
In addition, above fixed parameters $FC_{BL,y}$ and $FC_{PE,y}$ have been moved to be monitoring parameters $FC_{BL,k,j}$ and $FC_{m,j}$ in line with the latest applied methodology AMS-I.I (version 04).

- **Corrections that have been approved during this monitoring period.**
  There is no correction observed during this monitoring period.

However, in the MR version 1, only corrections in CPA-DDs are mentioned, not related to the PoA. ***CAR 02*** *was raised.*

Refer to Appendix 4 for findings' details.

E.2.3.3. Inclusion of a monitoring plan

>>
N/A

E.2.3.4. Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline or other applied standards or tools

>>

- **Permanent changes that have been approved prior to this monitoring period;**
  The PoA voluntary changes AMS-I.C. (version 19) to AMS-I.I. (version 04). This post-registration change (PRC ref no: PRC-2898-001) has been approved by EB on 11/12/2017.

  Based on the post-registration change, Monitoring parameters have been changed in PoA-DD:

  Fixed parameters $FC_{BL,y}$ and $FC_{PE,y}$ have been moved to be monitoring parameters $FC_{BL,k,j}$ and $FC_{m,j}$ in line with the AMS-I.I. Furthermore, additional monitoring parameters $N_{k,o}$, $n_{k,y}$ (formerly N_k), $N_{m,y}$ & $MS_{\%i,y}$ have been added in line with the new methodology AMS-I.I (version 04).
  The details can be found in http://cdm.unfccc.int/PRCContainer/DB/prcp617554437/view

- **Permanent changes that have been approved during this monitoring period.**
  There is no Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline or other applied standards or tools observed during this monitoring period.

E.2.3.5. Changes to the programme design or project design

>>

- **Changes to the programme design that have been approved prior to this monitoring period;**
  The PoA voluntary changes AMS-I.C. (version 19) to AMS-I.I. (version 04). This post-registration change (PRC ref no: PRC-2898-001) has been approved by EB on 11/12/2017.
  Eligibility criteria for inclusion of CPAs in the PoA is updated to include the applicability conditions of AMS-I.I (instead of applicability conditions of AMS-I.C in the registered PoA DD and CPA DD), the remaining criteria is not affected.
  The details can be found in http://cdm.unfccc.int/PRCContainer/DB/prcp617554437/view

- **Changes to the programme design that have been approved during this monitoring period.**
  There is no Changes to the programme design observed during this monitoring period.

E.2.3.6. Change of coordination/managing entity

>>
N/A

E.2.3.7. Changes specific to afforestation and reforestation activities

>>
N/A

E.3. Component project activities

E.3.1. Compliance of the CPA implementation with the included CPA design document

Means of verification	According to VVS for PoA version 01.0, the verification team conducted an on-site inspection from 02/07/2018 to 10/07/2018 to assess that all physical features (technology, project equipment, and monitoring procedures) of the included CDM CPAs in this monitoring period are in places and the CME and CPAs implementer have operated the CPA as per the latest approved PoA-DD and CPA- DDs. During on-site visit, the verification team checked the biogas digesters equipped in each sampled household. Each biogas digester system consists of components such as inlet, inlet pipe, fermentation chamber, gas chamber storage, hydraulic chamber, movable cover and gas tube. Verification team is able to confirm that the systems were equipped in line with the latest approved CPA-DDs. The digesters were designed according to relevant regulations, checked and accepted by local authority/19/. Therefore, based on this on-site visit and the reviewed project documentation, the verification team confirms that the realized technology, the project equipment, included CPA and household number, as well as the CME name/responsibility are consistent with the description in the CPA design document. During this monitoring period a new statement on the existing total household number as well as the number included in each CPA were issued by the SREO/27/. In the statement, SREO confirmed that in this monitoring period the number of included CPAs and included households was not changed (same as the registration and inclusion process). Moreover, during the on-site verification, a full list of the households equipped with biogas digesters/28/ were verified by verification team on which name, digester ID, digester location, and construction date were clearly indicated. Table of checked and accepted documents for all constructed biogas digesters/19/ were also randomly checked and verification team able to confirm that it is accepted by the local authority. Through checking above mentioned documents, it is able to confirm that the total number of household equipped with biogas digester is 395,435 and the households included in each CPA are not changed, which is consistent with the latest approved CPA-DDs.
Findings	**CL 02** (Refer to Appendix 4)
Conclusion	CL 02 is closed. Refer to Appendix 4 for findings' resolution. In conclusion, based on document review, and stakeholder interview, together based on verification team's local and sectoral expertise, it is confirmed that: The implementation and operation of the registered CPA has been conducted in accordance with the description contained in the latest approved PoA-DD and CPA-DDs; There is no deviation or the proposed or actual changes in the implementation or operation of the registered/included CPA comply with the requirements of the Project Standard. The actual CPA implementation is in line with latest approved CPA-DDs and situation of previous monitoring periods/52-55/.

E.3.2. Post-registration changes

E.3.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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N/A

E.3.2.2. Corrections

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- **Corrections that have been approved prior to this monitoring period;**
  A correction was made for CPA 2898-0002 to CPA 2898-0053 during the first verification on the monitoring period (10/05/2012 – 05/06/2013).
  PRC reason: The parameter $FC_{BL,y}$ and $FC_{PE,y}$ in the CPA-DDs of CPA 2898-0002 to CPA 2898-0053 should be the total coal consumption before and after installation for all the households in the entire CPA, but it was wrongly indicated as the average coal consumption per household in the original registered CPA-DDs. Therefore, a correction in the CPA-DDs of 2898-0002 to 2898-0053 was made, the value of $FC_{BL,y}$ and $FC_{PE,y}$ was corrected as the absolute coal consumption in the entire CPA.
  And the correction as a post-registration change was approved on 03/01/2014.
  In addition, above fixed parameters $FC_{BL,y}$ and $FC_{PE,y}$ have been moved to be monitoring parameters $FC_{BL,k,j}$ and $FC_{m,j}$ in line with the latest applied methodology AMS-I.I (version 04).

- **Corrections that have been approved during this monitoring period.**
  There is no correction observed during this monitoring period.

E.3.2.3. Changes to the start date of the crediting period of component project activities

>>
N/A

E.3.2.4. Inclusion of a monitoring plan

>>
N/A

E.3.2.5. Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline, or other applied standards or tools

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- **Permanent changes that have been approved prior to this monitoring period;**
  The PoA voluntary changes AMS-I.C. (version 19) to AMS-I.I. (version 04). This post-registration change (PRC ref no: PRC-2898-001) has been approved by EB on 11/12/2017.

  Based on the post-registration change, Monitoring parameters have been changed in CPA-DDs:

  Fixed parameters $FC_{BL,y}$ and $FC_{PE,y}$ have been moved to be monitoring parameters $FC_{BL,k,j}$ and $FC_{m,j}$ in line with the AMS-I.I. Furthermore, additional monitoring parameters $N_{k,o}$, $n_{k,y}$ (formerly N_k), $N_{m,y}$ & $MS_{\%i,y}$ have been added in line with the new methodology AMS-I.I (version 04).
  The details can be found in http://cdm.unfccc.int/PRCContainer/DB/prcp617554437/view

- **Permanent changes that have been approved during this monitoring period.**
  There is no Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline or other applied standards or tools observed during this monitoring period.

E.3.2.6. Changes to the programme design or project design

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- **Changes to the programme design that have been approved prior to this monitoring period;**
  The PoA voluntary changes AMS-I.C. (version 19) to AMS-I.I. (version 04). This post-registration change (PRC ref no: PRC-2898-001) has been approved by EB on 11/12/2017.
  Eligibility criteria for inclusion of CPAs in the PoA is updated to include the applicability conditions of AMS-I.I (instead of applicability conditions of AMS-I.C in the registered PoA DD and CPA DD), the remaining criteria is not affected.
  The details can be found in http://cdm.unfccc.int/PRCContainer/DB/prcp617554437/view

- **Changes to the programme design that have been approved during this monitoring period.**
  There is no Changes to the programme design observed during this monitoring period.

E.3.2.7. Changes specific to afforestation and reforestation component project activities

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N/A

E.3.3. Compliance of the registered monitoring plan with the methodology including applicable tool(s) and standardized baseline

Means of verification	According to VVS for PoA version 01.0 para. 342 to 344, the verification team conducted verification of compliance of monitoring plan with the monitoring methodology including applicable tool and standardized baseline. During the document review and furthermore during the on-site visit, the verification team has reviewed the registered monitoring plan and compared it with the applied methodology to verify their compliance. The verification team conducted the documents review including validation report, PRC assessment, latest approved PoA-DD, each latest approved CPA-DDs, previous verification reports and their related monitoring reports. Via checking the latest approved CPA-DDs, it is confirmed that the CPAs apply the monitoring methodology AMS-I.I.– *Biogas/biomass thermal applications for households/small users* (version 04) and AMS-III.R.– *Methane recovery in agricultural activities at household/small farm level* (version 02). The actual procedures followed for monitoring of parameters are checked against the parameters and procedures provided in the respective applied methodologies. All parameters stated in the monitoring plan and the applied methodology has been fulfilled in the current monitoring report. All baseline/project emission parameters has been verified and found satisfactory. To verify the validity of the data/parameters, the verification team checked the parameters one by one, comparing the data in MR and the inspection findings during the site-visit, the discussion regarding each parameter has been elaborated in the further sections of this report. The monitoring plan as mentioned in the respective validated CPA-DD is in accordance with the applied methodology. Implementation of sampling plan was conducted by applying 95/10 confidence/precision, according to the "Standard For Sampling And Surveys For CDM Project Activities And Programme Of Activities"/41/. The sampling procedures are confirmed in compliance with the requirement of representative sampling methods in the applied monitoring methodology AMS-I.I.– Biogas/biomass thermal applications for households/small users (version 04) (refer to section D.4 above for detailed assessment).
Findings	**CAR 03** (Refer to Appendix 4)
Conclusion	CAR 03 is closed. Refer to Appendix 4 for findings' resolution. According to the VVS for PoA Version 01, the verification team confirms that: The monitoring plan of the registered/included CPAs is in compliance with the

	approved monitoring methodologies (AMS-I.I, version 04 and AMS-III.R, version 02)/32,33/ including applicable tool(s). There is no applicable standardized baseline according to the latest approved PoA-DD and included CPA-DDs.

E.3.4. Compliance of monitoring activities with the registered monitoring plan

E.3.4.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification

The documents review and the site visit revealed that a complete set of data for the specified monitoring period is available. The correctness of information provided in the monitoring report has been crosschecked against the latest approved PoA- DD and/or included CPA-DDs.
The following ex-ante parameters have been checked the compliance with the latest approved monitoring plan.

Parameter	Unit	Applied Value and Assessment
$VS_{LT,y}$ - Daily volatile solid excreted per animal	kg dry matter $animal^{-1}$ $year^{-1}$	The applied value derived from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories/44/, Volume 4, and Chapter 10, Table 10A-7 (swine), the value for the daily solid excreted by Asian swines multiplied with 365 days in a year (=0.3*365 kg dry matter $animal^{-1}$ $year^{-1}$). Value is 109.5.
$B_{0,LT}$ - Maximum methane producing capacity for manure produced by livestock, of VS excreted.	m^3CH_4 kg^{-1}	The applied value derived from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories/44/, Volume 4, and Chapter 10, Table 10A-7 (swine). Conservative standard value for Asian swine is applied for all animals in the calculations of emission reduction of the proposed PoA. Value is 0.29.
GWP_{CH4} - Global warming potential for CH_4.	1	In this monitoring period global warming potential for CH_4 is 25 according to para. 66 of EB69 meeting report "the Board agreed that the second commitment period global warming potentials (GWPs) shall apply to all calculations of emissions reductions or removals achieved from 01/012013"/39/. Value is 25.
D_{CH4} - Conversion factor of m^3CH_4 to kilogram CH_4.	kg/m^3	The applied value derived from the 2006 IPCC guidelines/44/, Volume 4, Chapter 10, Page 10.42. Value is 0.67.
UF_b - Model correction factor to account for model uncertainties	-	The applied value derived from the referred methodology AMS-III.D (version 17). Value is 0.94.

Findings

N/A

Conclusion

According to VVS for PoA Version 01.0 and based on the verification team's local and sectorial knowledge, the verification team confirms that:
All the ex-ante parameters have been correctly mentioned and justified in section E.1 of the MR and correctly applied in the ER calculation process/15/. The information of data and parameters fixed ex ante provided in the monitoring report is compliance with the latest approved PoA-DD and the latest approved CPA-DDs.

E.3.4.2. Data and parameters monitored

Means of verification

In accordance with PS for PoA (version 01.0), VVS for PoA (version 01.0), sample standard/guideline and applied methodologies included the applied tools, the verification team reviewed the MR, latest approved PoA-DD and included CPA-DDs, crosschecked against the other available data and documents, verified

whether monitored parameters in accordance with all relevant applicable requirements in the PS; whether the MR list all data and parameters to be monitored, as required by the applied methodologies (AMS-I.I. and AMS-III.R.) and whether the data and parameters obtained in a reasonable way, whether the sample plan conducted accordingly, the source and the applied value of the monitored parameter is acceptable; whether the parameters monitored explain the operational and management structure, responsibilities and institutional arrangement for data collection/archiving, QA/QC procedures.

The information flow and the values in the monitoring report were verified as follows:

Parameter	Value used	Assessment
$FC_{BL,k,j}$ - Annual consumption of baseline fossil fuel j	0.987*0.89 Tonnes	The value of this parameter is sourced from a comprehensive baseline survey of targeted households prior to the installation/commissioning conducted in June, 2010[/29/]. Via checking this representative sample survey[/29/] against the latest approved PoA-DD, it is confirmed that the mean value of $FC_{BL,k,j}$ is 0.987t. The relative error is 1.51% at the 95% confidence level. The value obtained 0.987t will multiply by 0.89 to account for uncertainties, i.e. 0.987t *0.89. As per paragraph 10(a) AMS-I.I (version 04). The value is fixed ex ante in the whole crediting period of each CPA in the CPA-DD. Furthermore, during on-site interviewed with households on a random sampling basis, it is confirmed that the main baseline fuel type is coal and annual baseline fuel consumption is 1.0572 t which is higher than the ex-ante value of 0.987t, hence, it is verified that the value used for ER calculation is conservative.
$FC_{m,j}$ - Annual consumption of fossil fuel type j (physical units, mass/volume) by application m	0.02513*1.12 Tonnes of coal	In accordance with the latest approved PoA-DD and CPA-DDs, as there is only coal as fossil fuel involved, the value of *j* is 1. Data has been sourced from a monitoring survey of targeted households after the installation/commissioning of the project equipment dated in March, 2017[/17/] for this monitoring period. In order to determine the value of $FC_{m,j}$ during this monitoring period, CME have followed sampling approach and randomly selected 200 households for interview. The information obtained from household interviews has been recorded in the form of questionnaire papers. Well trained survey staffs were in charge of collecting and recording the information from the questionnaire papers. The information collected by the survey staffs has been supplied to Chengdu Oasis Science & Technology Co., Ltd. (the CME) and data was transferred to automatic

				database system to determine the value of this parameter. Survey list of the 200 samples/17/ and the questionnaire papers filled by the households/18/ were provided to the verification team. Via checking the above evidence, it is confirmed that the mean value is 0.02513 t. The relative error is 7.50% at the 95% confidence level which is in line with the relevant requirements for sampling in the latest standard for sampling and surveys using a 95% confidence interval and a 10% margin of error. The value obtained 0.02513 t will multiply by 1.12 to account for uncertainties, i.e. 0.02513 t *1.12. This survey was conducted annually. The value obtained is multiplied by 1.12 to account for uncertainties. The verification team has also visited 85 of the households on a random sampling basis and interviewed the users during on-site inspection. Via the data gathered and calculated by verification team, it is confirmed that mean value is 0.02457 t which is lower than the value in MR used for PE calculation, hence it is confirmed that the value in MR is conservative. Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard. As per paragraph 11 of AMS-I.I (version 04), the difference between $FC_{BL,k,j}$ and $FC_{m,j}$ have to be cross-checked with biogas generation estimated as per relevant national standard. Via checking the "National rural biogas project construction plan (2006-2010)"/46/, it is confirmed that one 8m^3 biogas digester would generate biogas 385m^3 annually, the heat efficiency of biogas stove is confirmed above 55% through checking GB/T 3606-2001 (Domestic Biogas Stove)/45/, the heat efficiency of coal stove is confirmed as 20% via verify the Coal stove test report/59/. The NCV of coal is 5,000 kcal per kg via the China Energy Statistics Yearbook 2016/61/, while the NCV of biogas is also 5,000 kcal per m^3 via China Energy Statistics Yearbook 2016/61/. Therefore, The amount of coal replacement is calculated as: 385m^3 * 5,000kcal/m^3 * 55% / (5,000kcal/kg * 20%) = 1,058.75kg

			Hence, it is concluded that this value is larger than the coal replacement with biogas in this monitoring period (850.28kg), it is confirmed that the value of 850.28kg is reasonable, thus the value of 0.02513t is verified as reasonable used for the ER calculation.
	$N_{k,0}$ - Number of thermal applications k commissioned	2898-0001: 1,000 2898-0073: 3,350 All other CPAs: 4,601 The total number for the 87 CPAs during this monitoring period is 395,435.	After the installation of the bio-digesters and biogas stoves, they have been inspected as acceptance testing (commissioning) for proper operation in compliance with specifications. The acceptance check date of each sub-system has been recorded. Via checking the Commission record[/25/], it is confirmed that the total number for the 87 CPAs of this monitoring period is 395,435, including: CPA Nb. 2898-0001: 1,000; CPA Nb. 2898-0073: 3,350; All other CPAs: 4,601
	$n_{k,y}$ - Proportion of $N_{k,0}$ that remain operating at year *y* (fraction)	99.5%	In order to determine the number of systems operating in each CPA, CME have followed sampling approach and randomly selected 200 households for interview. The information obtained from household interviews has been recorded in the form of questionnaire papers. Well trained survey staffs were in charge of collecting and recording the information from the questionnaire papers. The information collected by the survey staffs has been supplied to Chengdu Oasis Science & Technology Co., Ltd. (the CME) and data was transferred to automatic database system to determine the value of this parameter. Survey list of the 200 samples[/17/], the questionnaire papers filled by the households[/18/], and Table of checked and accepted documents[/19/] were provided to the verification team. Via checking these evidence, it is confirmed that 199 of all sampled 200 biogas digesters and stoves were under operation, hence the operation rate is calculated as 99.5%. The verification team has also visited 85 of the households on a random sampling basis and interviewed the users during on-site inspection. Via the information gathered by verification team, it is confirmed that all sampled 85 biogas digesters and stoves were under operation, hence it is confirmed that the value in MR is conservative. Based on the result of acceptance sampling, the monitoring records are

			deemed acceptable in accordance with the sampling standard.
	$N_{m,y}$ - Number of thermal application *m* remaining in use in year *y*.	2898-0001: 1,000 2898-0073: 3,350 All other CPAs: 4,601 The total number for the 87 CPAs during this monitoring period is 395,435.	*m* refers to coal stove as there is only coal stove involved. Sampling monitoring survey with a sampling size determined following the latest guidelines and the applied methodologies. In order to determine the number of coal stove remaining in use in each CPA, CME have followed sampling approach and randomly selected 200 households for interview. The information obtained from household interviews has been recorded in the form of questionnaire papers. Well trained survey staffs were in charge of collecting and recording the information from the questionnaire papers. The information collected by the survey staffs has been supplied to Chengdu Oasis Science & Technology Co., Ltd. (the CME) and data was transferred to automatic database system to determine the value of this parameter. Survey list of the 200 samples[/17/] and the questionnaire papers filled by the households[/18/] were provided to the verification team. Via checking these evidence, it is confirmed that all sampled 200 households had coal stoves in use in year 2016, hence the value is confirmed as following: 2898-0001: 1,000 2898-0073: 3,350 All other CPAs: 4,601 The total number for the 87 CPAs during this monitoring period is 395,435. Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys using a 95% confidence interval and a 10% margin of error. The verification team has also visited 85 of the households on a random sampling basis and interviewed the households during on-site inspection. Via the information gathered by verification team, it is confirmed that all sampled 85 households have coal stoves in use, hence it is confirmed that the value in MR is correct. Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance

			with the sampling standard.
	t- Mean annual operation hours of the digesters	8,562.24 hours	In order to determine the mean annual operation hours of the digesters, CME have followed sampling approach and randomly selected 200 households for interview. The data obtained from household interviews has been recorded in the form of questionnaire papers. Well trained survey staffs were in charge of collecting and recording the information from the questionnaire papers. The information collected by the survey staffs has been supplied to Chengdu Oasis Science & Technology Co., Ltd. (the CME) and data was transferred to automatic database system to determine the value of this parameter. Survey list of the 200 samples[/17/] and the questionnaire papers filled by the households[/18/] were provided to the verification team. Via checking these evidence, it is confirmed that mean annual operation hours of the digesters is calculated as following: 356.76 days*24 hours/day= 8,562.24 hours Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys using a 95% confidence interval and a 10% margin of error. The verification team has also visited 85 of the households on a random sampling basis and interviewed the households during on-site inspection. Via the data gathered and calculated by verification team, it is confirmed that mean annual operation hours of the digesters is calculated as following: 358.73 days*24 hours/day= 8,609.52 hours Hence it is confirmed that the value in MR is conservative. Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard.
	T - Mean annual temperature in city *k*. This parameter determines the emission factors of the existing manure management	Bazhong: 17.9 Chengdu: 16.8 Dazhou: 18.5 Deyang: 17.4 Guang'an: 17.7 Guangyuan: 16.6 Kangding: 8.4 Leshan: 18.6 Luzhou: 18.3	According to the latest approved PoA-DD and CPA-DDs, Data should be derived from official sources (e.g. the Sichuan Statistical Yearbook) and latest available official publication should be used. When the monitoring report is published on the UNFCCC website, Sichuan Statistical Yearbook 2017[/42/]

	systems.	Maerkang: 9.5 Meishan: 18.2 Mianyang: 17.9 Nanchong: 17.8 Neijiang: 18.0 Panzhihua: 20.8 Suining: 18.0 Xichang: 17.6 Yaan: 17.1 Yibin: 19.0 Zigong: 18.8 Ziyang: 18.1	which provided the annual average temperature for the year 2016 is checked as the latest available source. Therefore, Mean annual temperature in the Sichuan Statistical Yearbook 2017 for the year 2016 is used. Through checking the Sichuan Statistical Yearbook 2017[/42/], it is confirmed that the value used in the MR is correct and in line with the evidence.
	$MCF_{j,k}$ - Methane conversion factors for each manure management system j in climate region k.	Bazhong: 35 Chengdu: 32 Dazhou: 39 Deyang: 32 Guang'an: 35 Guangyuan: 32 Kangding: 17 Leshan: 39 Luzhou: 35 Maerkang: 17 Meishan: 35 Mianyang: 35 Nanchong: 35 Neijiang: 35 Panzhihua: 46 Suining: 35 Xichang: 35 Yaan: 32 Yibin: 39 Zigong: 39 Ziyang: 35	The value is the methane conversion factor under different temperature. As the 395,435 households are distributed in 13 different cities, the methane conversion factor is different from each other due to different temperature. The value is available in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10, Table 10.17[/44/], in which, different temperature is corresponding different $MCF_{j,k}$ value. As the mean annual temperature is for year 2016 which is derived from Sichuan Statistical Yearbook 2017[/42/], thus the corresponding value derived from IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10, Table 10.17[/44/] is confirmed as correctly used in the MR.
	$N_{LT,y}$ - Annual average number of animals of type LT in year y (numbers).	4.17	In order to determine the annual average number of animals, CME have followed sampling approach and randomly selected 200 households for interview. The number of animals was determined based on the number of pigs per households and the number of households in a given CPA. The data obtained from household interviews has been recorded in the form of questionnaire papers. Well trained survey staffs were in charge of collecting and recording the information from the questionnaire papers. The information collected by the survey staffs has been supplied to Chengdu Oasis Science & Technology Co., Ltd. (the CME) and data was transferred to automatic database system to determine the value of this parameter. Survey list of the 200 samples[/17/] and the questionnaire papers filled by the households[/18/] were provided to the verification team. Via checking these evidence, it is confirmed that annual average number of pigs is 4.17. Monitoring has been done through a

			statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys using a 95% confidence interval and a 10% margin of error. And the relative error is calculated as 7.33% at the 95% confidence level. The monitoring of this parameter have met the confidence/precision of 95%/10%. The verification team has also visited 85 of the households on a random sampling basis and interviewed the households during on-site inspection. Via the data gathered and calculated by verification team, it is confirmed that annual average number of pigs is calculated as 4.276 which is higher than the MR value, thus it is confirmed that the value in MR is conservative. Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard.
	$MS\%_{i,y}$ - Fraction of manure handled in project animal manure management system i (i.e. digestion in the newly installed biogas digester)	100%	In order to determine the fraction of manure handled in biogas digester, CME have followed sampling approach and randomly selected 200 households for interview. The information obtained from household interviews has been recorded in the form of questionnaire papers. Well trained survey staffs were in charge of collecting and recording the information from the questionnaire papers. The information collected by the survey staffs has been supplied to Chengdu Oasis Science & Technology Co., Ltd. (the CME) and data was transferred to automatic database system to determine the value of this parameter. Survey list of the 200 samples/17/ and the questionnaire papers filled by the households/18/ were provided to the verification team. Via checking these evidence, it is confirmed that all the manure generated has been fed into biogas digesters directly for all sampled 200 households, hence the value is confirmed as 100%. Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys using a 95% confidence level and a 10% acceptable error.

			The verification team has also visited 85 of the households on a random sampling basis and interviewed the households during on-site inspection. Via the information gathered by verification team, it is confirmed that all the manure generated has been fed into biogas digesters directly for all sampled 85 households, hence it is confirmed that the value in MR is correct. Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard.
	Proper sludge application ratio - Land application of digestate from biogas digesters to avoid anaerobic digestion	100%	In order to determine the proper sludge application ratio, CME have followed sampling approach and randomly selected 200 households for interview. The information obtained from household interviews has been recorded in the form of questionnaire papers. Well trained survey staffs were in charge of collecting and recording the information from the questionnaire papers. The information collected by the survey staffs has been supplied to Chengdu Oasis Science & Technology Co., Ltd. (the CME) and data was transferred to automatic database system to determine the value of this parameter. Survey list of the 200 samples/17/ and the questionnaire papers filled by the households/18/ were provided to the verification team. Via checking these evidence, it is confirmed that all sampled 200 households apply the sludge according to the requirements, hence the value is confirmed as 100%. Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys using a 95% confidence level and a 10% acceptable error. The verification team has also visited 85 of the households on a random sampling basis and interviewed the households during on-site inspection. Via the information gathered by verification team, it is confirmed that all sampled 85 households apply the sludge according to the requirements, hence it is confirmed that the value in MR is correct. Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance

			with the sampling standard.
	$EF_{CO2,i,y}$ - Emission Factor of raw coal	87.30 tCO_2/TJ	According to the latest approved PoA-DD and CPA-DDs, latest available official publication should be used. When the monitoring report is published on the UNFCCC website, latest data available is the official data from Chinese DNA. Therefore, Emission Factor of raw coal of Chinese DNA's Guideline of emission factors of Chinese grids 2016 is applied[/43/]. Via checking the Official data from Chinese DNA[/43/], it is confirmed that the value is correctly used in the MR.
	$NCV_{i,y}$ - Net Calorific Value of raw coal	20.908 GJ/t	According to the latest approved PoA-DD and CPA-DDs, latest available official publication should be used. When the monitoring report is published on the UNFCCC website, latest data available is the official data from Chinese DNA. Therefore, Net Calorific Value of raw coal of Chinese DNA's Guideline of emission factors of Chinese grids 2016 is applied[/43/]. Via checking the Official data from Chinese DNA[/43/], it is confirmed that the value is correctly used in the MR.
Findings	**CL 03, CL 04** **CAR 04, CAR 05, CAR 06, CAR 07, CAR 08** (Refer to Appendix 4)		
Conclusion	All the findings above is closed. Refer to Appendix 4 for findings' resolution. Therefore, based on the document review and onsite verification, according to VVS for PoA Version 01.0 para 345 to 349 and based on the verification team's local and sectorial knowledge, it is confirmed that • the monitoring activities comply with the monitoring plan of the registered PoA-DD and the CPA-DDs; • all parameters that are baseline, project and leakage emission parameters are monitored as described in the registered monitoring plan; • the frequency of monitoring and recording are in line with the registered monitoring plan contained in the latest approved PoA-DD and each CPA-DDs; • the data generation of the parameters above is reliable and the procedures applied by the CME are appropriate. The data management of parameters above (data aggregation, data recording and data values) is considered to be appropriate. The QA/QC of the parameters was established according to the registered CPA-DDs and applied methodologies (including tools).		

E.3.4.3. Implementation of sampling plan

Means of verification	According to the latest version of VVS when the sample conducted, sample standard/guideline and applied methodologies included the applied tools, a single sample was drawn for all 87 included CPAs for this monitoring period in the PoA level by the CME from the monitoring database in line with the Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities (hereafter can be referred to as the "sampling guideline"). According to the applied methodologies, confidence/precision of 90/10 is acceptable for sampling. According to the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, confidence/precision of 95/10 should be applied when the sampling plan covered a group of CPAs. For this PoA, confidence/precision is determined as 95/10. Therefore, it is able to confirm that the selection of confidence/precision is appropriate by verification team.

	In this monitoring period (01/01/2016-31/12/2016), there are 87 CPAs including 395,435 households in this PoA[/26-28/.] All the households are located in Sichuan province, which is a limited area. Simple random sampling approach was selected for this PoA due to relatively homogenous population being studied, given the similar average ambient temperature and similar living habit of residents in Sichuan. Therefore, simple random sampling (SRS) approach was followed by the PP to determine the sample size, and it is able to confirm the selection of sampling approach is appropriate as per verification team's local knowledge. Target population is defined as all the households included in the PoA, i.e. 395,435 households in all included CPAs. According to the methodologies applied and latest approved PoA-DD and CPA-DDs, sampling approach is applied for the monitoring parameters: • $FC_{m,j}$ - Annual consumption of fossil fuel type *j* coal (physical units, mass/volume) by application *m*; • $n_{k,y}$ - Proportion of $N_{k,0}$ that remain operating at year *y* (fraction); • $N_{m,y}$ - Number of thermal application *m* remaining in use in year *y*; • *t* - Mean annual operation hours of the digesters; • $N_{LT,y}$ - Annual average number of animals of type *LT* in year *y* (numbers); • $MS\%_{i,y}$ - Fraction of manure handled in project animal manure management system *i* (i.e. digestion in the newly installed biogas digester); • Proper sludge application ratio - Land application of digestate from biogas digesters to avoid anaerobic digestion; The sample size of the PoA considering the parameters is calculated in a conservative way, and the least number of the sample size is 139 for two different methodology combinations. The CME chose 200 for conservation as the same. Refer to section D.4 of this report for detail assessment of the implementation of sampling plan.
Findings	**CL 05** **CAR 09** (Refer to Appendix 4)
Conclusion	CL 05 and CAR 09 is closed. Refer to Appendix 4 for findings' resolution. According to latest version of Guidelines: Sampling and surveys for CDM project activities and programmes of activities[/40/] and Standard: Standard for sampling and surveys for CDM project activities and Programme of Activities[/41/], and based on the verification team's local and sectorial knowledge, the verification team confirms that the sampling approach applied by the CME is in accordance with the latest approved PoA-DD and the CPA-DDs. The sample plan is reasonable to conduct and the implementation is well performed and results of the sample survey can be accepted. The implementation of sample plan is in line with the VVS for PoA (version 01.0), sample standard/guideline[/40,41/] and applied methodologies[/32,33/] included the applied tools.

E.3.4.4. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	According to para 350 to 356, VVS for PoA (version 01.0), DOE shall determine whether the calibration of the measuring equipment that has an impact on the claimed GHG emission reductions or net anthropogenic GHG removals is conducted by the coordinating/managing entity at a frequency specified in the applied methodologies, the applied standardized baselines and/or the registered monitoring plan. As there is no measuring equipment stated in the latest approved PoA-DD and included CPA-DDs, all the parameters values are applied default values or public data or calculated based on sample survey results, thus this compliance requirement is not applicable of the PoA.
Findings	N/A
Conclusion	N/A

E.3.5. Assessment of data and calculation of emission reductions or net removals

E.3.5.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification

According to VVS for PoA (version 01.0), a complete set of data for the specified monitoring period is verified. Information provided in the monitoring report has been crosschecked with other sources such as sampling survey results and commission records. Calculations of baseline GHG emissions have been verified whether carried out in accordance with the formulae and methods described in the latest approved monitoring plan and the applied methodology.

Any assumptions used in emission or removal calculations have been justified. Whether the appropriate emission factor, IPCC default values, GWP and other reference values have been correctly applied. The correctness of information provided in the monitoring report has been verified by cross checks with Survey list of the 200 samples/17/, Questionnaire paper/18/ that filled by the investigated households, Table of checked and accepted documents for all constructed biogas digesters signed by local authority/19/, Sichuan Statistical Yearbook 2017/42/, IPCC default value/44/, and Chinese DNA's Guideline of emission factors of Chinese grids 2016/43/.

There are two parts of the baseline emissions, baseline emissions from an existing animal manure management system and baseline emissions due to the reduction of coal consumption.

i. The baseline emissions from an existing animal manure management system $BE_{CH4,y}$ can be calculated as formula below:

$$BE_{CH_4,y} = GWP_{CH_4} \cdot D_{CH_4} \cdot UF_b \cdot \sum_{j,LT} MCF_j \cdot B_{0,LT} \cdot N_{LT,y} \cdot VS_{LT,y} \cdot MS\%_{Bl,j} \quad 1$$

Where:

$BE_{CH_4,y}$	Baseline methane emissions in year y (tCO_2e)
GWP_{CH_4}	Global Warming Potential for CH_4 (25 from 01/01/2013 onwards)
D_{CH_4}	CH_4 density (0.00067 t/m^3 at room temperature (20 °C) and 1 atm pressure)
UF_b	Model correction factor to account for model uncertainties (0.94)
j	Index for animal manure management system. As – according to the applicability criteria - all households use pits to store the animal manure, this index is used for the different climate conditions on a city basis. As most of the CPAs only cover households in one city (refer section A.2), this index will only cover one city.
LT	Index for all types of livestock
MCF_j	Annual methane conversion factor (MCF) for the baseline animal manure management system j. To pay respect to different annual mean temperatures in the covered region, the pits in different cities are considered different manure management systems with different MCF values.
$B_{0,LT}$	Maximum methane producing capacity for the volatile solid generated for animal type LT (m^3 $CH_4(kgdm)^{-1}$)
$N_{LT,y}$	Annual average number of animals of type LT in year y (numbers). The number of animals will be determined based on city averages of the number of pigs per households and the number of households in each city (=climatic region).
$VS_{LT,y}$	Volatile solids for livestock LT entering the animal manure management system in year y (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{Bl,j}$	Fraction of manure handled in baseline animal manure management system j. As the index j is covered the different climate conditions of the cities, this fraction reflects the share of animals in a climatic region to the total number of animals.

For all the parameters used for calculation, GWP_{CH4}, D_{CH4}, UF_b, $B_{0,LT}$, $VS_{LT,y}$, $MS\%_{Bl,j}$ are ex-ante determined value in line with the latest approved PoA-DD and CPA-DDs and applied methodology. While, MCF_j, $N_{LT,y}$ are monitored parameters

and have been assessed in above section.

For the specific calculation of baseline emissions of each CPA within this monitoring period, the result of equation above is multiplied with three factors to be reasonable and conservative:
Time: To account for the length of the monitoring period, the length of the monitoring period in days divided by 366 is applied as a factor. For CPA 2898-0001 to 2898-0087, the factor is 366/366 = 1.
Households with proper sludge application: To exclude households without proper sludge application, the baseline emissions are multiplied with the monitoring parameter "Proper Sludge Application". During this monitoring period, 100% of sampled households have proper sludge application.
Number of households: Multiplying the baseline emissions per household with the number of households in the CPA leads to the baseline emissions in the entire CPA. During this monitoring period, 199 of 200 sampled households have biogas digesters operation, share of households in operation is 99.5% for each CPA. Therefore, during this monitoring period, the number of households used for calculation for each CPA is: 2898-0001: 995; 2898-0073: 3,333, remaining CPAs: 4,578 per CPA.

ii. The baseline emissions due to coal replacement $BE_{CO2,y}$ can be calculated as formula below:

$$BE_{CO_2,y} = \sum_k \sum_j N_{k,0} * n_{k,y} * FC_{BL,k,j} * NCV_j * EF_{FF,j} \quad (2)$$

Where:

$BE_{CO_2,y}$	Baseline carbon dioxide emissions from fossil fuel combustion in year *y* (tCO_2e)
K	Index for the type of thermal applications introduced by the project activity (e.g. cook stove, water heater). Only one type of thermal application, i.e. cook stove is considered.
J	Index for the type of baseline fossil fuel consumed. Here *J* is 1 as only coal is considered. This is conservative.
$N_{k,0}$	Number of thermal applications *k* commissioned;
$n_{k,y}$	Proportion of $N_{k,0}$ that remain operating in year *y* (fraction)
$FC_{BL,k,j}$	Annual consumption of baseline fossil fuel *j* (mass or volume unit). For this project, only baseline emissions from coal consumption are considered in the calculation of emission reductions. This is a conservative approach.
NCV_j	Net calorific value of the fossil fuel *j* (GJ/mass or volume unit). According to national data published by NDRC, the NCV of raw coal is 20.908 GJ/t.
$EF_{FF,j}$	Is the CO_2 emission coefficient of fuel *j* in year y (tCO_2/GJ). National data published by NDRC of coal (87.3 tCO_2/TJ) is applied.

For all the parameters used for calculation, $N_{k,0}$, $n_{k,y}$, $FC_{BL,k,j}$, NCV_j and $EF_{FF,j}$ are monitored parameters and have been assessed in above section.

Findings	**CAR 10** (Refer to Appendix 4)
Conclusion	CAR 10 is closed. Refer to Appendix 4 for findings' resolution. According to Para. 357 to 359 of VVS for PoA Version 01.0, the verification team checked and recalculated the ER calculation sheet and confirms that: 1. A complete set of data for the specified monitoring period was available and is duly reported. 2. As indicated above, the description with regard to cross-check of reported data is included under respective parameter. 3. Appropriate methods and formulae for calculating baseline GHG emissions or baseline net GHG removals were followed. 4. Appropriate emission factor, IPCC default values, GWP value and other

	reference values have been correctly applied. 5. The sheet is reproducible and calculation was correctly applied. The confirmed value of baseline emissions is 924,468 tCO_2e.

E.3.5.2. Calculation of project GHG emissions or actual net GHG removals by sinks

Means of verification

According to VVS for PoA (version 01.0), a complete set of data for the specified monitoring period is verified. Information provided in the monitoring report has been crosschecked with other sources such as sampling survey results and commission records. Calculations of project GHG emissions have been verified whether carried out in accordance with the formulae and methods described in the latest approved monitoring plan and the applied methodology.

Any assumptions used in emission or removal calculations have been justified. Whether the appropriate emission factor, IPCC default values, GWP and other reference values have been correctly applied. The correctness of information provided in the monitoring report has been verified by cross checks with Survey list of the 200 samples[17], Questionnaire paper[18] that filled by the investigated households, Table of checked and accepted documents for all constructed biogas digesters signed by local authority[19], Sichuan Statistical Yearbook 2017[42], IPCC default value[44], and Chinese DNA's Guideline of emission factors of Chinese grids 2016[43].

There are two parts of the project emissions, project emissions from physical leakage and project emissions due to the coal consumption.

i. The project emissions from physical leakage $PE_{CH4,y}$ can be calculated as formula below：

$$PE_{CH_4,y} = 0.10 \cdot GWP_{CH_4} \cdot D_{CH_4} \cdot \sum_{i,LT} B_{0,LT} \cdot N_{LT,y} \cdot VS_{LT,y} \cdot MS\%_{i,y} \quad (3)$$

Where:

$PE_{CH_4,y}$	Project methane emissions in year y (tCO_2e)
GWP_{CH_4}	Global Warming Potential for CH_4 (25 from 01/01/2013 onwards)
D_{CH_4}	CH_4 density (0.00067 t/m^3 at room temperature (20deg C) and 1 atm pressure)
i	Index for animal manure management system. As – according to the applicability criteria - all households use pits to store the animal manure, this index is used for the different climate conditions on a city basis.
LT	Index for all types of livestock
$B_{0,LT}$	Maximum methane producing capacity for the volatile solid generated for animal type *LT* (m^3 CH_4 (kg dm)$^{-1}$)
$N_{LT,y}$	Annual average number of animals of type LT in year y (numbers). The number of animals will be determined based on city averages of the number of pigs per households and the number of households in a given city.
$VS_{LT,y}$	Volatile solids for livestock LT entering the animal manure management system in year y (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{i,j}$	Fraction of manure handled in system i in year y. As the index i covers the different climate conditions of the cities, this fraction reflects the share of household in a given city.

For all the parameters used for calculation, GWP_{CH4}, D_{CH4}, $B_{0,LT}$, $VS_{LT,y}$ are ex-ante determined value in line with the latest approved PoA-DD and CPA-DDs and applied methodology. While $N_{LT,y}$, $MS\%_{i,y}$ are monitored parameters and have been assessed in above section.

For the specific calculation of project emissions of each CPA within this monitoring period, the result of equation above is multiplied with two factors:

Time: To account for the length of the monitoring period, the length of the monitoring period in days divided by 366 is applied as a factor. For CPA 2898-0001 to 2898-0087, the factor is 366/366 = 1.

Households with proper sludge application: To exclude households without proper

sludge application, the project emissions are multiplied with the monitoring parameter "Proper Sludge Application". During this monitoring period, 100% of sampled households have proper sludge application.

ii. The project emissions from coal consumption $PE_{CO2,y}$ can be calculated as formula below：

$$PE_{CO_2,y} = \sum_m \sum_j N_{m,y} * FC_{m,j} * NCV_j * EF_{FF,j} \quad (4)$$

Where:

$PE_{CO_2,y}$	Project carbon dioxide emissions from fossil fuel combustion in year y (tCO_2e)
m	Index for thermal application (e.g. cook stove, water heater) not decommissioned by the project activity. In this POA, only cook stove is involved, here m is 1.
$N_{m,y}$	Number of thermal application m remaining in use in year y
$FC_{m,j}$	Annual consumption of fossil fuel type j (physical units, mass/volume) by application m (use 90/10 precision for sampling and sampling requirements specified for baseline sampling described in paragraph 10(a) above may be applied). Option (ii) under paragraph 10(a) is chosen, the value obtained is multiplied by 1.12 to account for uncertainties. Here, coal as fossil fuel is accounted for.
NCV_j	Net calorific value of the fossil fuel j (GJ/mass or volume unit). According to national data published by NDRC, the NCV of raw coal is 20.908 GJ/t.
$EF_{FF,j}$	Is the CO_2 emission coefficient of fuel *j* in year *y* (tCO_2/GJ). National data published by NDRC of coal (87.3 tCO_2/TJ) is applied.

For all the parameters used for calculation, $N_{m,y}$, $FC_{m,j}$, NCV_j and $EF_{FF,j}$ are monitored parameters and have been assessed in above section.

Findings	**CAR 11** (Refer to Appendix 4)
Conclusion	CAR 11 is closed. Refer to Appendix 4 for findings' resolution. According to Para. 357 to 359 of VVS for PoA Version 01.0, the verification team checked and recalculated the ER calculation sheet and confirms that: 1. A complete set of data for the specified monitoring period was available and is duly reported. 2. As indicated above, the description with regard to cross-check of reported data is included under respective parameter. 3. Appropriate methods and formulae for calculating project GHG emissions or project net GHG removals were followed. 4. Appropriate emission factor, IPCC default values, GWP value and other reference values have been correctly applied. 5. The sheet is reproducible and calculation was correctly applied. The confirmed value of project emissions is 107,690 tCO_2e.

E.3.5.3. Calculation of leakage GHG emissions

Means of verification	Calculations of leakage GHG emissions have been verified whether carried out in accordance with the formulae and methods described in the latest approved monitoring plan and the applied methodologies. As per the PoA-DD, the leakage is determined by paragraph 11 of AMS-III.R and paragraph 15 of AMS-I.I: *11. If the methane recovery and combustion equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.* *15. If the energy generating equipment introduced by the project activity is transferred from outside the boundary to the project activity, leakage is to be considered.* Via on-site inspection and checking all the related documents such as Biogas stove

	test report[30] and Table of checked and accepted documents for all constructed biogas digesters[19], it is confirmed that both paragraphs are not applicable to the proposed project as no equipment was transferred from or to another activity and no collection/processing/transportation takes place outside the project boundary during this monitoring period.
Findings	N/A
Conclusion	According to the approved revised PoA-DD and the CPA-DDs, it is confirmed that the leakage emissions of this PoA and its CPAs are 0.

E.3.5.4. Summary of calculation of GHG emission reductions or net GHG removals by sinks

Means of verification	According to VVS for PoA (version 01.0), a complete set of data for the specified monitoring period is verified. Information provided in the monitoring report has been crosschecked with other sources such as sampling survey results and commission records. Calculations of GHG emission reductions have been verified whether carried out in accordance with the formulae and methods described in the latest approved monitoring plan and the applied methodology. Any assumptions used in emission or removal calculations have been justified. Whether the appropriate emission factor, IPCC default values, GWP and other reference values have been correctly applied. The correctness of information provided in the monitoring report has been verified by cross checks with Survey list of the 200 samples[17], Questionnaire paper[18] that filled by the investigated households, Table of checked and accepted documents for all constructed biogas digesters signed by local authority[19], Sichuan Statistical Yearbook 2017[42], IPCC default value[44], and Chinese DNA's Guideline of emission factors of Chinese grids 2016[43]. There are two parts of the emission reductions, emission reductions from an existing animal manure management system and emission reductions due to the coal replacement. The equations used to calculate the emission reductions are listed as follow: $ER_{CH4,y} = BE_{CH4,y} – PE_{CH4,y} – LE$ $ER_{CO2,y} = BE_{CO2,y} – PE_{CO2,y} – LE$ $ER_y = ER_{CH4,y} + ER_{CO2,y}$
Findings	**CAR 12** (Refer to Appendix 4)
Conclusion	CAR 12 is closed. Refer to Appendix 4 for findings' resolution. According to Para. 357 to 359 of VVS for PoA Version 01.0, the verification team checked and recalculated the ER calculation sheet and confirms that: 1. A complete set of data for the specified monitoring period was available and is duly reported. 2. As indicated above, the description with regard to cross-check of reported data is included under respective parameter. 3. Appropriate methods and formulae for calculating GHG emission reductions or net GHG removals were followed. 4. Appropriate emission factor, IPCC default values, GWP value and other reference values have been correctly applied. 5. The sheet is reproducible and calculation was correctly applied. The confirmed value of emission reductions is 816,778 tCO_2e.

Title and UNFCCC reference number of the CPA	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_2e)	Leakage (tCO_2e)	GHG emission reductions or net GHG removals by sinks (tCO_2e)		
				Amount achieved before 1 January 2013	Amount achieved from 1 January 2013	Amount achieved in the entire monitoring period
2898-0001	2,407	272	0	0	2,135	2,135
2898-0002	11,073	1,253	0	0	9,820	9,820

2898-0003	11,073	1,253	0	0	9,820	9,820
2898-0004	11,073	1,253	0	0	9,820	9,820
2898-0005	11,073	1,253	0	0	9,820	9,820
2898-0006	11,073	1,253	0	0	9,820	9,820
2898-0007	11,073	1,253	0	0	9,820	9,820
2898-0008	11,073	1,253	0	0	9,820	9,820
2898-0009	11,073	1,253	0	0	9,820	9,820
2898-0010	11,073	1,253	0	0	9,820	9,820
2898-0011	10,690	1,253	0	0	9,437	9,437
2898-0012	10,690	1,253	0	0	9,437	9,437
2898-0013	10,690	1,253	0	0	9,437	9,437
2898-0014	10,690	1,253	0	0	9,437	9,437
2898-0015	10,690	1,253	0	0	9,437	9,437
2898-0016	10,690	1,253	0	0	9,437	9,437
2898-0017	10,690	1,253	0	0	9,437	9,437
2898-0018	10,690	1,253	0	0	9,437	9,437
2898-0019	10,690	1,253	0	0	9,437	9,437
2898-0020	10,690	1,253	0	0	9,437	9,437
2898-0021	10,690	1,253	0	0	9,437	9,437
2898-0022	10,690	1,253	0	0	9,437	9,437
2898-0023	10,690	1,253	0	0	9,437	9,437
2898-0024	10,690	1,253	0	0	9,437	9,437
2898-0025	10,690	1,253	0	0	9,437	9,437
2898-0026	10,690	1,253	0	0	9,437	9,437
2898-0027	10,690	1,253	0	0	9,437	9,437
2898-0028	10,690	1,253	0	0	9,437	9,437
2898-0029	10,690	1,253	0	0	9,437	9,437
2898-0030	10,690	1,253	0	0	9,437	9,437
2898-0031	10,690	1,253	0	0	9,437	9,437
2898-0032	10,690	1,253	0	0	9,437	9,437
2898-0033	10,690	1,253	0	0	9,437	9,437
2898-0034	10,690	1,253	0	0	9,437	9,437
2898-0035	11,073	1,253	0	0	9,820	9,820
2898-0036	10,690	1,253	0	0	9,437	9,437
2898-0037	10,690	1,253	0	0	9,437	9,437
2898-0038	10,690	1,253	0	0	9,437	9,437
2898-0039	10,690	1,253	0	0	9,437	9,437
2898-0040	10,690	1,253	0	0	9,437	9,437
2898-0041	10,690	1,253	0	0	9,437	9,437
2898-0042	10,690	1,253	0	0	9,437	9,437
2898-0043	10,690	1,253	0	0	9,437	9,437

2898-0044	10,690	1,253	0	0	9,437	9,437
2898-0045	10,690	1,253	0	0	9,437	9,437
2898-0046	10,690	1,253	0	0	9,437	9,437
2898-0047	11,073	1,253	0	0	9,820	9,820
2898-0048	11,073	1,253	0	0	9,820	9,820
2898-0049	11,073	1,253	0	0	9,820	9,820
2898-0050	10,690	1,253	0	0	9,437	9,437
2898-0051	10,690	1,253	0	0	9,437	9,437
2898-0052	9,579	1,253	0	0	8,326	8,326
2898-0053	10,847	1,253	0	0	9,594	9,594
2898-0054	10,690	1,253	0	0	9,437	9,437
2898-0055	10,690	1,253	0	0	9,437	9,437
2898-0056	10,690	1,253	0	0	9,437	9,437
2898-0057	10,690	1,253	0	0	9,437	9,437
2898-0058	10,690	1,253	0	0	9,437	9,437
2898-0059	10,690	1,253	0	0	9,437	9,437
2898-0060	10,690	1,253	0	0	9,437	9,437
2898-0061	10,690	1,253	0	0	9,437	9,437
2898-0062	10,690	1,253	0	0	9,437	9,437
2898-0063	10,690	1,253	0	0	9,437	9,437
2898-0064	10,690	1,253	0	0	9,437	9,437
2898-0065	11,073	1,253	0	0	9,820	9,820
2898-0066	11,073	1,253	0	0	9,820	9,820
2898-0067	10,690	1,253	0	0	9,437	9,437
2898-0068	10,677	1,253	0	0	9,424	9,424
2898-0069	10,690	1,253	0	0	9,437	9,437
2898-0070	10,690	1,253	0	0	9,437	9,437
2898-0071	10,704	1,253	0	0	9,451	9,451
2898-0072	10,866	1,253	0	0	9,613	9,613
2898-0073	7,908	913	0	0	6,995	6,995
2898-0074	11,073	1,253	0	0	9,820	9,820
2898-0075	10,690	1,253	0	0	9,437	9,437
2898-0076	11,073	1,253	0	0	9,820	9,820
2898-0077	10,690	1,253	0	0	9,437	9,437
2898-0078	10,690	1,253	0	0	9,437	9,437
2898-0079	10,690	1,253	0	0	9,437	9,437
2898-0080	10,690	1,253	0	0	9,437	9,437
2898-0081	10,690	1,253	0	0	9,437	9,437
2898-0082	9,804	1,253	0	0	8,551	8,551
2898-0083	10,712	1,253	0	0	9,459	9,459
2898-0084	11,005	1,253	0	0	9,752	9,752

2898-0085	10,690	1,253	0	0	9,437	9,437
2898-0086	10,769	1,253	0	0	9,516	9,516
2898-0087	10,929	1,253	0	0	9,676	9,676
Total	**924,468**	**107,690**	**0**	**0**	**816,778**	**816,778**

E.3.5.5. Comparison of actual GHG emission reductions or net GHG removals by sinks with estimates in included CPA

Means of verification	Compared the monitoring report with the latest approved CPA-DDs and PoA-DD, and found the actual value achieved during this monitoring period is 816,778 tCO_2e, which is less than values (876,123 tCO_2e) estimated according to the latest approved CPA-DDs.
Findings	N/A
Conclusion	The MR includes a comparison of the calculated actual emission reductions with the ex-ante calculated values in the latest approved CPA-DDs. It is confirmed that the ex-post determined value was found to be proportionally lower than the ex-ante estimated value.

Title and UNFCCC reference number of the CPA	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the CPAs during this monitoring period
2898-0001	2,282[1]	2,135
2898-0002	10,502	9,820
2898-0003	10,502	9,820
2898-0004	10,502	9,820
2898-0005	10,502	9,820
2898-0006	10,502	9,820
2898-0007	10,502	9,820
2898-0008	10,502	9,820
2898-0009	10,502	9,820
2898-0010	10,502	9,820
2898-0011	10,061	9,437
2898-0012	10,061	9,437
2898-0013	10,061	9,437
2898-0014	10,061	9,437
2898-0015	10,061	9,437
2898-0016	10,061	9,437
2898-0017	10,061	9,437
2898-0018	10,061	9,437
2898-0019	10,061	9,437
2898-0020	10,061	9,437
2898-0021	10,061	9,437
2898-0022	10,061	9,437
2898-0023	10,061	9,437
2898-0024	10,061	9,437
2898-0025	10,061	9,437

[1] For the value estimated ex ante calculation in the included CPA-DDs, it's calculated based on the days in the monitoring period multiplied by the ex-ante ER value in the registered CPA-DDs. Please refer to the ER calculation sheet and the registered CPA-DDs

2898-0026	10,061	9,437
2898-0027	10,061	9,437
2898-0028	10,061	9,437
2898-0029	10,061	9,437
2898-0030	10,061	9,437
2898-0031	10,061	9,437
2898-0032	10,061	9,437
2898-0033	10,061	9,437
2898-0034	10,061	9,437
2898-0035	10,061	9,820
2898-0036	10,502	9,437
2898-0037	10,502	9,437
2898-0038	10,502	9,437
2898-0039	10,502	9,437
2898-0040	10,502	9,437
2898-0041	10,502	9,437
2898-0042	10,061	9,437
2898-0043	10,061	9,437
2898-0044	10,061	9,437
2898-0045	10,061	9,437
2898-0046	10,061	9,437
2898-0047	10,502	9,820
2898-0048	10,502	9,820
2898-0049	10,502	9,820
2898-0050	10,502	9,437
2898-0051	10,502	9,437
2898-0052	8,654	8,326
2898-0053	10,147	9,594
2898-0054	10,502	9,437
2898-0055	10,061	9,437
2898-0056	10,061	9,437
2898-0057	10,061	9,437
2898-0058	10,061	9,437
2898-0059	10,061	9,437
2898-0060	10,061	9,437
2898-0061	10,061	9,437
2898-0062	10,061	9,437
2898-0063	10,061	9,437
2898-0064	10,061	9,437
2898-0065	10,502	9,820
2898-0066	10,502	9,820
2898-0067	10,061	9,437
2898-0068	10,114	9,424
2898-0069	10,061	9,437
2898-0070	10,061	9,437
2898-0071	10,077	9,451
2898-0072	10,502	9,613

2898-0073	7,646	6,995
2898-0074	10,502	9,820
2898-0075	10,061	9,437
2898-0076	10,061	9,820
2898-0077	10,502	9,437
2898-0078	10,502	9,437
2898-0079	10,061	9,437
2898-0080	10,061	9,437
2898-0081	10,502	9,437
2898-0082	8,873	8,551
2898-0083	10,087	9,459
2898-0084	10,502	9,752
2898-0085	10,164	9,437
2898-0086	10,152	9,516
2898-0087	10,502	9,676
Total	**876,123**	**816,778**

E.3.5.6. Remarks on difference from estimated value in included CPA

Means of verification	Compared the monitoring report with the latest approved CPA-DDs and PoA-DD, and found the actual value achieved during this monitoring period is 816,778 tCO_2e, which is 6.77% less than values (876,123 tCO_2e) estimated according to the latest approved CPA-DDs.
Findings	**CAR 13** (Refer to Appendix 4)
Conclusion	CAR 13 is closed. Refer to Appendix 4 for findings' resolution. The MR includes a comparison of the calculated actual emission reductions with the ex-ante calculated values in the latest approved CPA-DDs. It is confirmed that the ex-post determined value was found to be proportionally lower than the ex-ante estimated value. No further justification or explanation is deemed required as actual emissions of this MP do not exceed the ex-ante calculated emission reductions.

E.3.6. Assessment of reported sustainable development co-benefits

Means of verification	According to para 360 to 362 of VVS for PoA 01.0, the verification team has checked the latest approved PoA-DD, CPA-DDs and the Sustainable Development Co-benefits Description Report of the PoA, the document separately from the monitoring plan to monitor sustainable development co-benefits of the CDM PoA, including the frequency of reporting of monitoring results. As the PoA is also registered as Gold Standard PoA (GS1239) in the same time, thus the sustainable development co-benefits monitoring report is conducted strictly following the registered GS-PoA monitoring plan.
Findings	N/A
Conclusion	The sustainable development co-benefits monitoring[/60/] is conducted well according to para 68 of PS for PoA version 01.0.

E.3.7. Global stakeholder consultation

Means of verification	According to para 369 and 370 of VVS 01.0, there is no comments received, thus it is not applicable.
Findings	N/A
Conclusion	N/A

SECTION F. Internal quality control

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The final verification report was undergone a technical review by a qualified independent reviewer before requesting issuance of the project activity. The technical review was performed by a technical reviewer qualified in accordance with CTI's qualification scheme for CDM validation and verification that meets the criteria of EB guidelines for qualification.

SECTION G. Verification opinion

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The verification team assigned by the DOE (CTI) concludes that the 5th periodic verification of CDM programme of activities "Sichuan Rural Poor-Household Biogas Development Programme" in Sichuan Province, China, as described in the latest approved PoA-DD (Version 2, 30/10/2017) and monitoring report (version 2, 15/08/2018), meets all relevant requirements of the UNFCCC for CDM PoA including article 12 of the Kyoto Protocol, the modalities and procedures for CDM (Marrakesh Accords) project activities including carbon dioxide capture and storage in geological formation and the subsequent decisions by the COP/MOP and CDM Executive Board. The verification is conducted in-line with the VVS requirements.

The project activity was correctly implemented according to selected monitoring methodology and monitoring plan. The collected monitoring data allowed to verify the amount of achieved GHG emission reductions. Thus, the DOE is pleased to issue a positive verification opinion.

SECTION H. Certification statement

>>

Shenzhen CTI International Certification Co., Ltd (CTI) has performed the 5th periodic verification of the emission reductions that have been reported for the CDM programme of activities "Sichuan Rural Poor-Household Biogas Development Programme" in Sichuan Province, P. R. China for the period 01/01/2016 to 31/12/2016.

The verification is based on the baseline and monitoring methodology AMS-I.I.– Biogas/biomass thermal applications for households/small users (version 04) and AMS-III.R.– Methane recovery in agricultural activities at household/small farm level (version 02), the latest approved PoA-DD (Version 2, 30/10/2017), the latest approved CPA-DDs for CPA 2898-0001 to 2898-0087 and the monitoring report (Version 2, dated 15/08/2018). The verification consisted of the following three phases: i) desk review of the project design and the baseline and monitoring plan; ii) follow-up on-site visit and interviews with project participants; iii) resolution of outstanding issues and the issuance of the final verification and certification report.

The CME are responsible for the collection, calculation and determination of the GHG data in accordance with the monitoring plan and the reporting of GHG emission reductions on the basis set out within the project monitoring report.

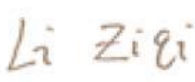
It is CTI's responsibility to provide an independent verification statement on the reported GHG emission reductions for the project. Based on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these, CTI planned and performed our work to obtain the information and explanations that we considered necessary to provide reasonable assurance that reported GHG emission reductions are fairly stated.

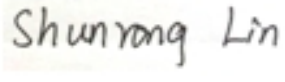
CTI confirms that the GHG emission reductions are calculated without material misstatements. Based on the evidence and information that are considered necessary to guarantee that GHG emission reductions are appropriately calculated, CTI confirms that the emission reductions from the "Sichuan Rural Poor-Household Biogas Development Programme" in Sichuan Province, P. R. China during the monitoring period 01/01/2016 to 31/12/2016 as follows:

Monitoring Period Number: 5th

Monitoring period: 01/01/2016 to 31/12/2016

Emission reductions: 816,778 t CO_2e





Mr. Li Ziqi
Team Leader
17/08/2018

Shunrong Lin
Technical Reviewer
17/08/2018

Appendix 1. Abbreviations

Abbreviations	Full texts
AQL	Acceptable Quality Level
BE	Baseline Emissions
Board	Executive Board of the clean development mechanism
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board (the board)
CER	Certified Emission Reductions
CH_4	Methane
CL	Clarification Request
CME	Coordinating/Managing Entity
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COP	Conference of the Parties
CPA	Component Project Activity
CPA-DD	Component project activity design document
CTI	Shenzhen CTI International Certification Co., Ltd
DNA	Designated National Authority
DOE	Designated Operational Entity
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse Gas
GWP	Global Warming Potential
MoC	Modalities of communication
MoV	Means of Verification
MP	Monitoring Plan
MR	Monitoring Report
PE	Project Emission
PoA	Programme of Activities
PoA-DD	PoA Design Document
PRC	Post Registration Change
PS	Project Standard
QA/QC	Quality Assurance / Quality Control
SREO	Sichuan Rural Energy Office
SS	Sectoral Scope
SSC	Small-scale
TA(s)	Technical Area(s)
UNFCCC	United Nations Framework Convention on Climate Change
UQL	Unacceptable Quality Level
VVS	Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers

Mr. Ziqi LI

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	√	√	√	√	-	√

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources
SS 5: Chemical industry	TA 5.1: Chemical industry
	TA 5.2: Caprolactam, nitric and adipic acid
SS 11: Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	TA 11.1: Emissions of fluorinated gases
	TA 11.2: Refrigerant gas production
SS 12: Solvents use	TA 12.1: Chemical industry

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by:

Wu LIN Wu Lin

Technical Competent Manager

Shenzhen, 01/01/2018

Mr. Qinghua DAI

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	-	-	-	-	-	√

Scope	Technical Area
SS 13: Waste handling and disposal	TA 13.2: Manure
SS 15: Agriculture	TA 15.1: Agriculture

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by:

Wu LIN Wu Lin

Technical Competent Manager

Shenzhen, 28/06/2018

Ms. Shunrong LIN

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	√	√	√	√	√	√

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources
SS 14: Afforestation and reforestation	TA 14.1: Afforestation and reforestation
SS 15: Agriculture	TA 15.1: Agriculture

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by:

Wu LIN Wu Lin

Technical Competent Manager

Shenzhen, 01/01/2018

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
/1/	Chengdu Oasis Science & Technology Co., Ltd.	Monitoring Report (the 5th monitoring period), including CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087, Version 1 for GSC, dated 07/05/2018;	https://cdm.unfccc.int/PoAIssuance/mon_db/poamon1718657/viewMR	CME
/2/	Chengdu Oasis Science & Technology Co., Ltd.	Monitoring Report (the 5th monitoring period), including CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087, Version 2, dated 15/08/2018	-	CME
/3/	Chengdu Oasis Science & Technology Co., Ltd.	Registered PoA-DD: Sichuan Rural Poor-Household Biogas Development Programme version 1.6, dated 03/04/2012	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/4/	Chengdu Oasis Science & Technology Co., Ltd.	Latest approved PoA-DD: Sichuan Rural Poor-Household Biogas Development Programme version 2, dated 30/10/2017	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/5/	Chengdu Oasis Science & Technology Co., Ltd.	Registered CPA-DD Generic: Sichuan Rural Poor-household Biogas Development Programme, CPA Nb. SCHHBG-20XX-XX, version 1.4, dated 03/04/2012	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/6/	Chengdu Oasis Science & Technology Co., Ltd.	Registered CPA-DD specific: Sichuan Rural Poor-Household Biogas Development Programme, CPA Nb. SCHHBG-2010-001, version 1.4, dated 03/04/2012	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/7/	Chengdu Oasis Science & Technology Co., Ltd.	Registered CPA-DD specific: CPA Nb. SCHHBG-2012-002 to CPA Nb. SCHHBG-2012-053, version 1.1, dated 09/04/2013	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/8/	Chengdu Oasis Science & Technology Co., Ltd.	Registered CPA-DD specific: CPA Nb. SCHHBG-2013-054 to CPA Nb. SCHHBG-2013-073, version 1.2, dated 14/03/2014	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/9/	Chengdu Oasis Science & Technology Co., Ltd.	Registered CPA-DD specific: CPA Nb. SCHHBG-2014-074 to CPA Nb. SCHHBG-2014-087, version 1.3, dated 14/01/2015	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/10/	Chengdu Oasis Science & Technology Co., Ltd.	Latest Approved CPA-DD specific (after post-registration change): CPA Nb. SCHHBG-2010-001 version 1.8 dated 30/10/2017	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/11/	Chengdu Oasis Science & Technology Co., Ltd.	Latest Approved CPA-DD specific (after post-registration change): CPA Nb. SCHHBG-2012-002 to CPA Nb. SCHHBG-2012-053, version 1.4, dated 30/10/2017	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/12/	Chengdu Oasis Science & Technology Co., Ltd.	Latest Approved CPA-DD specific (after post-registration change): CPA Nb. SCHHBG-2013-054 to CPA Nb. SCHHBG-2012-073, version 1.4, dated 30/10/2017	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	CME
/13/	Chengdu Oasis Science & Technology	Latest Approved CPA-DD specific (after post-registration change): CPA Nb. SCHHBG-2014-074 to CPA Nb.	https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8C	CME

	Co., Ltd.	SCHHBG-2012-087, version 1.5, dated 30/10/2017	ZH2F/view	
/14/	Chengdu Oasis Science & Technology Co., Ltd.	Emission Reduction Calculation spreadsheet Initial Version 1, 07/05/2018 corresponding to MR for GSC	-	CME
/15/	Chengdu Oasis Science & Technology Co., Ltd.	Emission Reduction Calculation spreadsheet Final Version 2, 30/07/2018 corresponding to MR for EB submission	-	CME
/16/	Chengdu Oasis Science & Technology Co., Ltd.	Sample size calculation spreadsheet	-	CME
/17/	Chengdu Oasis Science & Technology Co., Ltd.	Survey list of the 200 samples version 1.0, March, 2017 version 2.0, 30/07/2018 (based on issued finding)	-	CME
/18/	Chengdu Oasis Science & Technology Co., Ltd.	Questionnaire paper that filled by the investigated households during sampling survey;	-	CME
/19/	Chengdu Oasis Science & Technology Co., Ltd.	Table of checked and accepted documents for all constructed biogas digesters	-	CME
/20/	Chengdu Oasis Science & Technology Co., Ltd.	Sample of manual check and acceptance records of the included CPAs	-	CME
/21/	Chengdu Oasis Science & Technology Co., Ltd.	Training material copy, photos of the training courses and training records of the survey staff of this PoA	-	CME
/22/	Chengdu Oasis Science & Technology Co., Ltd.	CDM GHG Monitoring Manual (incl. procedures and forms)	-	CME
/23/	Chengdu Oasis Science & Technology Co., Ltd.	Organization Chart of CME and CPA implementer and their responsibilities	-	CME
/24/	Chengdu Oasis Science & Technology Co., Ltd.	Operation manual of data management system of the PoA	-	CME
/25/	Chengdu Oasis Science & Technology Co., Ltd.	Commission record of the bio-digesters and biogas stoves	After the installation of the bio-digesters and biogas stoves, they have been inspected as acceptance testing (commissioning) for proper operation in compliance with specifications. The acceptance check date of each subsystem has been recorded.	CME
/26/	Sichuan Rural Energy Office	Statement on the number of household equipped with biogas digester in this PoA ((from CPA Nb. SCHHBG-2010- 001 to CPA Nb. SCHHBG-2014-087)	-	CME
/27/	Sichuan Rural Energy Office	Statement on the existing number of household equipped with biogas	-	CME

		digester and the number of household included in each CPA (from CPA Nb. SCHHBG-2010- 001 to CPA Nb. SCHHBG-2014-087)		
/28/	Sichuan Rural Energy Office	Household list that included in each CPA (from CPA Nb. SCHHBG-2010-001 to CPA Nb. SCHHBG-2014-087)	-	CME
/29/	Chengdu Oasis Science & Technology Co., Ltd.	Comprehensive baseline survey records conducted in Jun, 2010 before the PoA's commissioning.	-	CME
/30/	Sichuan Rural Energy Office	Biogas stove test report	-	CME
/31/	Chengdu Oasis Science & Technology Co., Ltd.	The IT system to collect and analyze the monitoring survey data Updated IT system to collect and analyze the monitoring survey data	-	CME
/32/	CDM Executive Board	Approved CDM methodology: AMS-I.I.: Biogas/biomass thermal applications for households/small users (version 04.0) (EB68, Annex 25)	https://cdm.unfccc.int/methodologies/DB/3WJ6C7R0JFA62VYA2Z2K6WE1RK1PXI	UNFCCC website
/33/	CDM Executive Board	Approved CDM methodology: AMS-III.R.: Methane recovery in agricultural activities at household/small farm level (version 02) (EB59, Annex 4)	http://cdm.unfccc.int/methodologies/DB/JQHRMGL23TWZ081T6G7G1RZ63GM1BZ	UNFCCC website
/34/	CDM Executive Board	CDM Standard: CDM validation and verification standard for programmes of activities (version 01.0)	EB93, Annex 8 https://cdm.unfccc.int/Reference/Standards/index.html	UNFCCC website
/35/	CDM Executive Board	CDM Standard: CDM project standard for programmes of activities (version 01.0)	EB93, Annex 7 https://cdm.unfccc.int/Reference/Standards/index.html	UNFCCC website
/36/	CDM Executive Board	CDM Procedure: CDM project cycle procedure for programmes of activities (version 01.0)	EB93, Annex 9 https://cdm.unfccc.int/Reference/Procedures/index.html	UNFCCC website
/37/	CDM Executive Board	Monitoring Report Form for CDM programme of activities (CDM-PoA-MR-FORM), Version 02.0	https://cdm.unfccc.int/Reference/PDDs_Forms/index.html	UNFCCC website
/38/	CDM Executive Board	Glossary CDM terms, version 09.1	https://cdm.unfccc.int/filestorage/e/x/t/extfile-20170831165430180-Glos_CDMv9_1.pdf/Glos_CDMv9_1.pdf?t=cVJ8cGF2YW1tfDBIBx7j_C9IBdVNo3GCq07H	UNFCCC website
/39/	CDM Executive Board	Application of the global warming potentials to Clean Development Mechanism project activities and programme of activities for the second commitment period of the Kyoto Protocol	Para. 66 of EB69 meeting report	UNFCCC website
/40/	CDM Executive Board	Guidelines for Sampling and Surveys for CDM Project Actives and Programme of Activities, version 4.0, 16/10/2015	EB 67, Annex 6 https://cdm.unfccc.int/Reference/Guidclarif/index.html	UNFCCC website
/41/	CDM Executive Board	Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 05.0, dated 16/10/2015 Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version	EB86, Annex 3 EB94, Annex 2 https://cdm.unfccc.int/Reference/Standards/index.html	UNFCCC website

		07.0, dated 04/05/2017		
/42/	Sichuan Statistics Bureau	Sichuan Statistical Yearbook 2017	http://www.sc.stats.gov.cn/tjcbw/tjnj/2017/zk/indexch.htm	Public Website
/43/	Chinese DNA	Chinese DNA's Guideline of emission factors of Chinese grids 2016	http://cdm.ccchina.gov.cn/Detail.aspx?newsId=61599&TId=19	China DNA Official Website
/44	IPCC	2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book	https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html	IPCC website
/45/	Chinese National Standard	Standard for household biogas digesters in Sichuan province, GB/T 3606-2001: Domestic Biogas Stove	www.china-nengyuan.com/tech/93670.html	Public Website
/46/	Ministry of Agriculture of the P.R. China	National rural biogas project construction plan (2006-2010)	http://jiuban.moa.gov.cn/zwllm/tzgg/tz/200704/t20070418_805366.htm	Public Website
/47/	TÜV NORD	Validation Report for CDM PoA Sichuan Rural Poor-Household Biogas Development Programme, version 01, dated 05/04/2012, issued by TÜV NORD	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/48/	TÜV NORD	Validation Report for CPA inclusion Sichuan Rural Poor-Household Biogas Development Programme, CPA Nb. SCHHBG-2010-001, version 01, dated 2012-04-05, issued by TÜV NORD	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/49/	TÜV NORD	Validation Reports for CPA inclusion Sichuan Rural Poor-Household Biogas Development Programme, CPA Nb. SCHHBG-2012-002 to CPA Nb. SCHHBG-2012-053, version 01, dated 10/04/2013	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/50/	TÜV NORD	Validation Reports for CPA inclusion Sichuan Rural Poor-Household Biogas Development Programme, CPA Nb. SCHHBG-2013-054 to CPA Nb. SCHHBG-2013-073, version 01, dated 20/03/2014	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/51/	TÜV NORD	Validation Reports for CPA inclusion Sichuan Rural Poor-Household Biogas Development Programme, CPA Nb. SCHHBG-2014-074 to CPA Nb. SCHHBG-2014-087, version 01, dated 14/01/2015	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/52/	GLC	Verification Report for the 1st monitoring period version 06 dated 26/08/2013, issued by GLC and 1st monitoring period monitoring report (version 1.4.1)	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/53/	GLC	Verification Report for the 2nd monitoring period, version 05 dated 17/06/2014, issued by GLC and 2nd monitoring period monitoring report (version 2.1)	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/54/	BV	Verification Report for the 3rd monitoring period, version 01.2 dated 01/12/2015, issued by BVC and 3rd monitoring period monitoring report (version 1.2)	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/55/	BV	Verification Report for the 4th monitoring period, version 2.1 dated	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96	UNFCCC website

		31/12/2017, issued by BVC and 4th monitoring period monitoring report (version 2.1)	VOK3ATN4JPR70XSWIQ8CZH2F/view	
/56/	GLC	Validation Opinion on Post-Registration Changes of Registered CDM PoA: Sichuan Rural Poor-Household Biogas Development Programme, version 05, dated 26/08/2013 issued by GLC approved by EB on 03/01/2014	http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/5BGM96VOK3ATN4JPR70XSWIQ8CZH2F/view	UNFCCC website
/57/	TÜV NORD	Validation Opinion on Post-Registration Changes of Registered CDM PoA: Sichuan Rural Poor-Household Biogas Development Programme, (PRC ref no: PRC-2898-001), version 02, dated 09/11/2017 issued by TÜV NORD approved by EB on 11/12/2017	http://cdm.unfccc.int/PRCContainer/DB/prcp617554437/view	UNFCCC website
/58/	CTI	On-site picture: pigpens, biogas digesters, living condition of each household, On-site information collected table and 85 questionnaires filled by randomly selected sampling households	-	-
/59/	Sichuan Rural Energy Office	Coal stove test report	-	CME
/60/	Chengdu Oasis Science & Technology Co., Ltd.	Monitoring report for sustainable development co-benefits	-	CME
/61/	National Bureau of statistics	China Energy Statistics Yearbook 2016	http://www.stats.gov.cn/	Public Website
/62/	Sichuan Rural Energy Office and Chengdu Oasis Science & Technology Co., Ltd.	Small scale SRS pre-survey	Small scale SRS pre-survey record in Apr 2011	CME
/63/	CDM Executive Board	"Applicability of sectoral scopes" (version 01.0, EB88, Annex 04)	EB88 https://cdm.unfccc.int/Reference/Standards/index.html	UNFCCC website
/64/	Local Rural Energy Office	Routine maintenance check records	Routine maintenance check records for the sample household with digester stop in year 2016	CME

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. Remaining FARs from validation and/or previous verification

FAR ID	N/A	**Section no.**		**Date:**
Description of FAR				
CME response				**Date:**
Documentation provided by the CME				
DOE assessment				**Date:**

Table 2. CLs from this verification

CL ID	01	**Section no.**	Cover Page	**Date:** 13/07/2018
Description of CL				
In the MR version 1, if standardized baselines are used or not is not specified in cover page.				
CME response				**Date:** 30/07/2018
Yes, the standardized baseline is not used in the POA. Such info has been specified in the cover page, see MR (v2).				
Documentation provided by the CME				
MR (version 2)/2/				
DOE assessment				**Date:** 31/07/2018
The revised MR is checked, it is confirmed that description of "Standardized baseline is not applied" is added and correct. CL 01 is closed.				

CL ID	02	**Section no.**	C	**Date:** 13/07/2018
Description of CL				
Via checking the Survey list of the 200 samples comparing with the IT system to collect and analyze the monitoring survey data, it is confirmed that some digesters' ID numbers are not consistent, clarification is requested, and the explanation of how to determine the ID numbers are unique to each digester is requested.				
CME response				**Date:** 30/07/2018
By checking the digester ID field and the survey material and IT system, 3 digesters were identified with this inconsistency. The ID of these digesters in IT system omit the subsidy year by mistake, for example, the digester ID "SC1210-049" is listed in IT system, which should be "2010SC1210-049". All of these digester ID has been updated in IT system. According to PoA design, the unique Digesters' ID is structured by 2 parts: one is the Digesters' ID field, which is given by local Rural Energy Offices independently according to subsidy and made a physical identification. The ID field is unique within each county but may overlap among different counties. The other part is the administrative division, which means the City and County info are included to generate PoA Digester ID numbers for each digester. So, the digesters' ID numbers can be guaranteed to be unique by identifying the PoA digester ID numbers, i.e. City – County – Digester ID. To avoid misunderstandings, the PoA digester ID including the administrative division have been used in all the documents. The above has been added in the section C.1 of MR (v2).				
Documentation provided by the CME				
MR (version 2)/2/ Survey list of the 200 samples (version 2.0) /17/ updated IT system/31/				

DOE assessment	Date: 31/07/2018
The updated IT system was provided by CME[/31/], via comparing with survey list of the 200 samples[/17/], it is confirmed that all the 200 digesters' ID are consistent. Also via checking the PoA digester ID in Survey list of the 200 samples and updated IT system, it is confirmed that the PoA digester ID listed are all consistent. The updated ID system are checked by the verification team, if using any PoA digester ID (from Household list that included in each CPA (from CPA Nb. SCHHBG-2010- 001 to CPA Nb. SCHHBG-2014-087)[/28/]) for searching, the correct household name, location and other relevant information would be shown in the updated ID system. And via checking the Commission record of the bio-digesters and biogas stoves[/25/], Statement on the number of household equipped with biogas digester in this PoA ((from CPA Nb. SCHHBG-2010- 001 to CPA Nb. SCHHBG-2014-087)[/26/], and Household list that included in each CPA (from CPA Nb. SCHHBG-2010- 001 to CPA Nb. SCHHBG-2014-087)[/28/], it is confirmed that PoA digester ID are consistent in all the files and these PoA digester ID are unique to each digester in this PoA. CL 02 is closed.	

CL ID	03	Section no.	E.2	Date: 13/07/2018
Description of CL				
During on-site interview with the digester users, it is concluded that not only the pig manure handled in installed biogas digester, people, chicken and duck manure of a few of households were handled in installed biogas digester too, the clarification of only consider pig manure handled in digester is requested.				
CME response				**Date:** 30/07/2018
Considering pig manure in the installed digesters only, it is conservative in terms of emission reductions due to CH_4 avoidance. In the baseline scenario, the animal manures of pig, duck, people, etc are treated in the deep manure pits and methane emissions are emitted to atmosphere. In the project scenario, all of the animal manures above are treated in the installed biogas digesters and less methane emissions are emitted. Taking pig manure treatment into account only, the emission reductions due to methane avoidances are conservative.				
Documentation provided by the CME				
MR (version 2)[/2/]				
DOE assessment				**Date:** 31/07/2018
Via on-site investigation, it is verified that pigs are the predominant livestock in Sichuan province. Although most of the households also raise chicken ad duck, they are not considered for the calculation of the baseline, as most of their manure is usually not fed into the digesters, but dropped by the chicken and duck outside of any confined environment, only very few may be handled in installed biogas digester. Peoples are not considered as well, as only very few of the households handled Peoples' manure. This approach is conservative. Via checking the POA validation report[/47/], it is confirmed that this issue had been considered during the determination of baseline, thus it is confirmed that only consider pig manure handled in digester is conservative for ER calculation. CL 03 is closed.				

CL ID	04	Section no.	E.2	Date: 13/07/2018
Description of CL				
During on-site interview with the digester users, it is concluded that not only coal as the fuel type utilized in both baseline and project scenario, other fuel such as nature gas, firewood and electricity are also used in some household, however, only coal consumption is used for calculation BE and PE, clarification is requested.				
CME response				**Date:** 30/07/2018
In the baseline scenario, before installation of biogas digesters, according to baseline survey, the fuel, incl. coal, natural gas, firewood and electricity were used in the daily lives of households. In the project scenario, with the biogas digesters, according to monitoring survey, the fuel, incl. coal, natural gas, firewood and electricity are also used in households. According to the baseline survey and monitoring survey results, it is shown that: biogas replaces a certain amount of coal, natural gas, firewood and electricity for energy use and no increases of natural gas, firewood and electricity consumption occur in the project scenario, compared with baseline survey data, respectively. In the baseline survey, the annual average consumption of coal, natural gas, firewood and electricity is 987kg, 22m^3, 2,381kg and 299KWh, respectively; while, in the monitoring survey, the annual average consumption of coal, natural gas, firewood and electricity is 25.13kg, 18.5m^3, 1,908kg and 290KWh, respectively. And coal replacement is dominating in the households. In the project, natural gas, firewood and electricity replacement with biogas are not taken into account, and only coal replacement with biogas is considered for emission reduction calculation, which is simplified and conservative.				
Documentation provided by the CME				

MR (version 2)[/2/]
Survey list of the 200 samples[/17/]
Comprehensive baseline survey records[/29/]

DOE assessment	**Date:** 31/07/2018

The results of Survey list of the 200 samples[/17/] were compared with the Comprehensive baseline survey records[/29/] by verification team, it is verified that no increases of natural gas, firewood and electricity consumption occurred in the project scenario compared with baseline scenario. Furthermore, during on-site interview with the household, it is confirmed that not only consumption of coal, but also natural gas, firewood and electricity for energy use were obviously reduced due to utilization of biogas for cooking. Hence, it is confirmed that only coal replacement with biogas considered for emission reduction calculation is conservative.
CL 04 is closed.

CL ID	05	**Section no.**	E.3	**Date:** 13/07/2018

Description of CL

In MR version 1 section E.3,
1. Description of how to conduct the small scale SRS pre-survey is not clarified.
2. Description of how to determine the value of P=0.8 is not clarified.
3. Description of how to determine the following values are not clarified.
   "Number of pigs: Mean: 5 pigs; Standard Deviation: 3 pigs
   Annual operation hours: 8,400 h; Standard Deviation: 1,200 h"
4. Description of how to determine the values of Pigs: 139 and operation hours: 8 is not clarified.
5. Description of how to select 200 sample and how to collect the data for this monitoring period is not clarified.

CME response	**Date:** 30/07/2018

1-4. The SRS pre-survey conduction process and relevant survey figures (as requested in the findings sub-no. 1, 2, 3, 4) and calculation formulas have been included in MR (v2).

The small scale SRS pre-survey for this PoA was conducted in Apr 2011 by Sichuan Rural Energy Office and had statistical analysis by C/ME. 30 households with installed biogas digesters are randomly selected to survey on the annual operation hours of biogas system, annual average pig numbers, sludge application rate and rate of digesters still in operation, by visiting each sampled household.
For the sampling of the number of pigs and the annual digester operation hours, according to pre-survey data, the following parameters are estimated (for the application of equation E.1):

- Number of pigs: Mean: $\overline{Y}$ = 5 pigs; Standard Deviation: S = 3 pigs
- Annual operation hours: $\overline{Y}$ = 8,400 h; Standard Deviation: S = 1,200 h

With application of equation E.1, the initial sample size n_0 is calculated as:
Number of pigs:

$$n_0 = \frac{t^2 S^2}{r^2 \overline{Y}^2} = \frac{1.96^2 3^2}{0.1^2 5^2} \approx 139$$

Annual operation hours:

$$n_0 = \frac{t^2 S^2}{r^2 \overline{Y}^2} = \frac{1.96^2 1200^2}{0.1^2 8400^2} \approx 8$$

For proportion, initial sample size n_0 can be calculated by formula:

$$n_0 = \frac{t^2 Q}{r^2 P} \qquad \text{(E.2)}$$

Where,

P	Proportion of sample
Q	Q = 1- P
r	Relative error. Default is 10%.
$t_{0.05}$	1.96

According to pre-survey data, 24 households have aerobic sludge application and in operation, the proportional parameters (sludge application rate and rate of digesters still in operation) have P=0.8 and Q =1- P =0.2.
With application of equation E.2, the initial sample size n_0 is calculated as:

$$n_0 = \frac{t^2 Q}{r^2 P} = \frac{1.96^2 * 0.2}{0.1^2 * 0.8} \approx 97$$

Using these values and equation E.1 the sampling sizes for these two parameters are:
Number of Pigs: 139; Annual Operation hours: 8

Using equations E.2, the sampling sizes for the proportional parameters (sludge application rate and rate of digesters still in operation) are calculated to be 97 as described above.
As a conservative approach, a sample size of 200 is chosen. This is bigger than all calculated minimum sampling sizes.
Supplementary survey is needed, in case, the data analysis of the baseline survey shows the pre-defined sample size is not sufficient to fulfill the requirement of confidence/precision.
5. In the excel sheet with involved 395,435 households' info, incl. city, county, town, village, name of household, digester ID, PoA digester ID, etc, 200 households are randomly selected from the 395,435 households list by the simple random sampling (SRS) method. The excel function "randbetween" of an excel sheet is employed to choose the households sample group.
The sampled households list was delivered to local REOs, which is responsible to implement survey. The survey team of each town is in charge of visiting the households in the project sample group and collecting data with the questionnaires. In the questionnaires, annual average number of swine raised, the year of bio-digester installation and fuel (coal, liquefied petroleum gas (LPG), electricity and firewood) consumption, operation hours of biogas digester and stove, etc are investigated for each sampled household.
The surveys have been performed by a survey team of two persons. After the questionnaire was filled, the surveyors and household owner signed the questionnaire form.
After the data collection by the survey team and checked by local REOs, all of the data is stored in an electronic database and forwarded to C/ME for statistical analysis, ex post emission reduction calculation and monitoring report conduction.

Documentation provided by the CME

MR (version 2)/2/
small scale SRS pre-survey records/62/

DOE assessment	**Date:** 31/07/2018

1. Via checking the survey record/62/, it is confirmed that a small group of 30 households with installed biogas digesters are randomly selected to investigate the annual operation hours of biogas system, annual average pig numbers, sludge application rate and rate of digesters still in operation. This description is confirmed as added into the revised MR.
2. Description of how to determine the value of P=0.8 is clarified. Via checking the small scale SRS pre-survey record/62/, it is confirmed that 24 households have aerobic sludge application and in operation, the proportional parameters (sludge application rate and rate of digesters still in operation) have P=0.8 (24/30), thus Q=1-P=0.2.
3. Description of how to determine the following values are clarified. Via checking the survey record/62/, it is confirmed that Number of pigs: Mean: 5 pigs; Standard Deviation: 3 pigs Annual operation hours: 8,400 h; Standard Deviation: 1,200 h are correctly estimated used for calculate the sampling number of pigs and the annual digester operation hours.
4. The calculation process of how to determine the values of Pigs: 139 and operation hours: 8 is clarified in the revised MR. Via checking the calculation process based on the formula determined in the sampling plan, it is confirmed that the results of the values are correct.
5. Description of how to select 200 sample and how to collect the data for this monitoring period is clearly stated in the revised MR. Via interview with the CME and survey staff, it is confirmed that 200 households are randomly selected from the 395,435 households list by the simple random sampling (SRS) method. The excel function "randbetween" is employed to choose the households sample group. The CME distributed the survey to local Rural Energy Offices, then the survey team of each town visited the households in the project sample group and collected data with the questionnaires.

Refer to section D.4 of this report for detail assessment.
CL 05 is closed.

Table 3. CARs from this verification

CAR ID	01	**Section no.**	Cover Page	**Date:** 13/07/2018

Description of CAR

In the MR version 1, the sectoral scope of this PoA is not defined as per Standard: Applicability of sectoral scopes (version 01.0).

CME response	**Date:** 30/07/2018

Yes, revised.
Scope 1: Energy industries (renewable - / non-renewable sources)
Scope 13: Waste handling and disposal
Note:
In the methodology AMS-III.R, the sectoral scope is 15, however, as per the EB standard "Applicability of sectoral scopes" (version 01.0, EB88, Annex 04), the scope of AMS-III.R is 13

Documentation provided by the CME

MR (version 2)/2/
DOE assessment **Date:** 31/07/2018
Via checking the EB standard "Applicability of sectoral scopes" (version 01.0, EB88, Annex 04)/63/, it is confirmed that for AMS-III.R., the scope is determined as following: If the recovered methane from agricultural activities is only flared and not used for any other purpose, then sectoral scope 13 alone applies. If the recovered methane is used for any other purpose, then sectoral scopes 13 and 1 apply. As the recovered methane from all the CPAs included in the PoA will be used for cooking, thus the sectoral scopes 13 and 1 apply. For AMS-I.I., the scope is determined as following: If thermal energy is generated using biogas, then sectoral scope 1 and 13 apply. If thermal energy is generated using biomass from dedicated plantations, then sectoral scopes 1 and 15 apply. For all other types of thermal energy generation, including from biomass residues, sectoral scope 1 alone applies. As the thermal energy is generated using biogas for all the CPAs included in the PoA, thus the sectoral scopes 1 and 13 apply. Hence, it is confirmed that the revised sectoral scope of this PoA, i.e 1 and 13 is defined as per Standard: Applicability of sectoral scopes (version 01.0). CAR 01 is closed.

CAR ID	02	**Section no.**	B.2.1	**Date:** 13/07/2018
Description of CAR				
In the MR version 1, only corrections in CPA-DDs are mentioned in B.2.1, not related to the PoA.				
CME response				**Date:** 30/07/2018
Yes, revised. There is no corrections of PoA that have been notified to the secretariat as applicable from the period prior to this monitoring period.				
Documentation provided by the CME				
MR (version 2)/2/				
DOE assessment				**Date:** 31/07/2018
The revised MR is checked, it is confirmed that the corrections related to CPA-DDs have been deleted from the section B.2.1 which only request the PRC of PoA. CAR 02 is closed.				

CAR ID	03	**Section no.**	D	**Date:** 13/07/2018
Description of CAR				
In MR version 1, Figure 3 Collection and transferring of the household data to the CME for further analysis in section D is not consistent with the latest approved PoA DD.				
CME response				**Date:** 30/07/2018
Yes, revised to be consistent with the PoA DD. See MR (v2).				
Documentation provided by the CME				
MR (version 2)/2/				
DOE assessment				**Date:** 31/07/2018
The revised MR is checked, it is confirmed that the Figure 3 is revised to be consistent with the latest approved PoA DD. CAR 03 is closed.				

CAR ID	04	**Section no.**	E.2	**Date:** 13/07/2018
Description of CAR				
In MR version 1, Section E.2, $FC_{m,j}$ parameter table: 1. The value of $FC_{m,j}$ is not consistent in the parameter table, 0.025 t against 0.02513 t. 2. The value of relative error 6.8% is not consistent with the 7.5% in section E.3. 3. How to calculate the value of coal replacement with biogas in this monitoring period of 850.43kg is not clarified.				
CME response				**Date:** 30/07/2018
1. The value of $FC_{m,j}$ is revised to be 0.02513t. See MR (v2). 2. The value of relative error is revised to be 7.5%, see MR (v2). 3. The coal replacement with biogas in this monitoring period is 850.28 kg, calculated as: $FC_{BL,k,j} - FC_{m,j}$ = 0.89*987 kg – 1.12*25.13 kg = 850.28 kg. The calculation process has been added in the ER sheet. See ER sheet (v2).				
Documentation provided by the CME				

MR (version 2)[/2/]
Survey list of the 200 samples[/17/]
Emission Reduction Calculation spreadsheet (version 2)[/15/]

DOE assessment	**Date:** 31/07/2018

1. The revised MR is checked, it is confirmed that the value of $FC_{m,j}$ is revised to be 0.02513t and consistent in the whole MR. Via checking the Survey list of the 200 samples[/17/], it is verified that the revised value is correct.
2. The revised MR is checked, it is confirmed that the value of relative error is revised to be 7.5% and consistent in the whole MR. Via checking the Survey list of the 200 samples[/17/], it is verified that the revised value is correct.
3. Via checking the Emission Reduction Calculation spreadsheet (version 2)[/15/], it is verified that the value of coal replacement with biogas in this monitoring period 850.28 kg is calculated as correct and the value is lower than the theoretically calculated value of amount of coal replacement, thus deemed as reasonable.

CAR 04 is closed.

CAR ID	05	**Section no.**	E.2	**Date:** 13/07/2018

Description of CAR

In MR version 1, Section E.2, $n_{k,y}$ parameter table:

1. QA/QC procedure result of this monitoring period is not provided.
2. Via checking the Survey list of the 200 samples and the questionnaire papers, it is observed that 199 of all sampled 200 biogas digesters and stoves were under operation. For the one biogas digester which was stopped during year 2016, it is found in the survey list that there was no pig raised by household, however, the quantities of coal consumption 150kg is not parallel to the value of coal consumption in baseline. Clarification is requested.

CME response	**Date:** 30/07/2018

1. QA/QC procedures have been added in the MR (v2): 200 households have been randomly selected for interview and visited one by one by local REOs. The operation of all 200 household biogas digesters and stoves have been inspected by local REOs and recorded in questionnaire, which was signed by each visiting household and local REO, respectively.
2. Yes. The household with digester stop in year 2016 moved for work outside and just came back from time to time (e.g. in the weekend), therefore, some coal consumption was happened during their stay at the rural home. In the routine maintenance check records of local biogas technician for visiting this household, it's indicated "no body at home" and "digester stop".
   This situation is also verified by interviewing with neighbors and local REO.

Documentation provided by the CME

MR (version 2)[/2/]
Questionnaire paper that filled by the investigated households during sampling survey[/18/]
Routine maintenance check records[/64/]

DOE assessment	**Date:** 31/07/2018

1. The revised MR is checked, QA/QC procedure result of this monitoring period is provided. Via checking the Questionnaire paper that filled by the investigated households during sampling survey[/18/], it is verified that the QA/QC procedure is correct and reasonable for this monitoring period.
2. Via checking the routine maintenance check records[/64/] for this household with digester stop in year 2016 against the questionnaire paper that filled by this household during sampling survey[/18/], it is confirmed that no pig raised by household and the family members were not at home every day and just came back from time to time (e.g. in the weekend) in year 2016. Thus the the quantities of coal consumption 150kg is deemed as reasonable during their stay at home. Furthermore, the verification team made a phone call with this household and got the same information with the questionnaire. Hence, it is confirmed that the value collected from monitoring survey is credible and actual.

CAR 05 is closed.

CAR ID	06	**Section no.**	E.2	**Date:** 13/07/2018

Description of CAR

In MR version 1, Section E.2, *t* parameter table:

1. The monitored value described in MR is not consistent with the survey result.
2. Actual sample size during this monitoring period is not provided.
3. The relative error result is not provided.

CME response	**Date:** 30/07/2018

1. Revised. The value of t is 8,562.24 (= operational days 356.76 * 24 hours per day), in line with the survey result;
2. Yes, added, see MR (v2).
3. Yes, added, see MR (v2).
   200 households have been randomly selected for interview and visited one by one by local REOs. The annual operation hours of all 200 household biogas digesters have been inspected by local REOs and recorded in questionanrie, which was signed by each visiting household and local REO, respectively.

   *According to monitoring survey, the mean value is 8,562.24 (= operational days 356.76 * 24 hours per day). The relative error is 1.06% at the 95% confidence level, in line with EB requirement "the Standard For Sampling And Surveys For CDM Project Activities And Programme Of Activities", with the level of confidence at least 95%, while the acceptable error is 10%.*

Documentation provided by the CME

MR (version 2)/2/
Survey list of the 200 samples/17/

DOE assessment	**Date:** 31/07/2018

1. The monitored value described in revised MR is checked as consistent with the survey result/17/.
2. Actual sample size during this monitoring period is provided which is checked as consistent with the survey result/17/.
3. The relative error result described in revised MR is checked as consistent with the survey result/17/. And the value is confirmed as calculated at the 95% confidence level which is in line with EB requirement "the Standard For Sampling And Surveys For CDM Project Activities And Programme Of Activities", with the level of confidence at least 95%, while the acceptable error is 10%.

CAR 06 is closed.

CAR ID	07	**Section no.**	E.2	**Date:** 13/07/2018

Description of CAR

In MR version 1, Section E.2, $N_{LT,y}$ parameter table:
1. The monitoring survey method as per the survey list is not provided.
2. Actual sample size during this monitoring period is not provided.

CME response	**Date:** 30/07/2018

1. Yes, the info has been added as requested.
2. 200 households have been randomly selected for interview and visited one by one by local REOs. The annual average pig number of each household in the monitoring period has been inspected by local REOs and recorded in questionnaire, which was signed by each visiting household and local REO, respectively. According to monitoring survey, the mean value is 4.17. The relative error is 7.33% at the 95% confidence level.

Documentation provided by the CME

MR (version 2)/2/
Survey list of the 200 samples/17/
Questionnaire paper that filled by the investigated households during sampling survey/18/

DOE assessment	**Date:** 31/07/2018

1. The monitoring survey method is confirmed as per the survey list/17/.
2. Actual sample size during this monitoring period is provided which is checked as consistent with the survey result/17/ and questionnaire/18/.

CAR 07 is closed.

CAR ID	08	**Section no.**	E.2	**Date:** 13/07/2018

Description of CAR

In MR version 1, Section E.2, $MS\%_{i,y}$ parameter table, the actual sample size during this monitoring period is not provided.

CME response	**Date:** 30/07/2018

Yes, added. See MR (v2).
200 households have been randomly selected for interview and visited one by one by local REOs. The fraction of manure treated in the biogas digester of each household in the monitoring period has been inspected by local REOs and recorded in questionnaire, which was signed by each visiting household and local REO, respectively.
According to monitoring survey, all of 200 sampled households have 100% of manure treated in biogas digesters during the monitoring period.

Documentation provided by the CME

MR (version 2)[/2/] Survey list of the 200 samples[/17/] Questionnaire paper that filled by the investigated households during sampling survey[/18/]
DOE assessment **Date:** 31/07/2018
Actual sample size during this monitoring period is provided which is checked as consistent with the survey result[/17/] and questionnaire[/18/]. CAR 08 is closed.

CAR ID	09	**Section no.**	E.3	**Date:** 13/07/2018
Description of CAR				
In MR version 1, Section E.3, the parameter $N_{m,y}$ is not shown in sampling results.				
CME response				**Date:** 30/07/2018
Revised. Added. See E.3 of MR (v2). All 200 sampled households have coal stoves in use, in this case, the total number of coal stoves in use for all 87 CPAs in the monitoring period is 395,435 ($N_{m,y}$);				
Documentation provided by the CME				
MR (version 2)[/2/] Survey list of the 200 samples[/17/] Questionnaire paper that filled by the investigated households during sampling survey[/18/]				
DOE assessment				**Date:** 31/07/2018
Revised MR is checked, it is confirmed that the parameter $N_{m,y}$ is added in sampling results of section E.3, the sampling result of this parameter is checked as consistent with the survey result[/17/] and questionnaire[/18/]. CAR 09 is closed.				

CAR ID	10	**Section no.**	F.1	**Date:** 13/07/2018
Description of CAR				
In MR version 1, Section F.1, for the calculation of baseline emission, 1. The parameter $MS\%_{BI,y}$ used for BE_{CH4} calculation is not listed in ER calculation sheet and the determined value is not stated in MR. 2. For the calculation of BE_{CH4}, the value of Households with proper sludge application and Number of households used for the specific calculation of baseline emissions of each CPA within this monitoring period is not specified. 3. The calculation process of BE_{CH4} and BE_{CO2} in ER sheet is not correct, thus the results are not correct in both ER sheet and MR.				
CME response				**Date:** 30/07/2018
1. Revised. The Parameter $MS\%_{BI,y}$ used for BE_{CH4} calculation has been listed in ER sheet and the value has been also explained in the MR. According to baseline survey, 100% manure has been handled in deep pit system. See MR (v2); 2. Revised. See MR (v2). *Households with proper sludge application: To exclude households without proper sludge application, the baseline emissions are multiplied with the monitoring parameter "Proper Sludge Application". During this monitoring period, 100% of sampled households have proper sludge application.* *Number of households: Multiplying the baseline emissions per household with the number of households in the CPA leads to the baseline emissions in the entire CPA. During this monitoring period, 199 of 200 sampled households have biogas digesters operation, share of households in operation is 99.5% for each CPA. Therefore, during this monitoring period, the number of households used for calculation for each CPA is:* *2898-0001: 995; 2898-0073: 3,333, remaining CPAs: 4,578 per CPA.* 3. Revised. See MR (v2). The uncertainty factor 0.89 has been accounted for twice wrongly in the calculation formula of baseline emissions. One 0.89 has been deleted.				
Documentation provided by the CME				
MR (version 2)[/2/] Survey list of the 200 samples[/17/] Comprehensive baseline survey records[/29/] Emission Reduction Calculation spreadsheet (version 2)[/15/]				
DOE assessment				**Date:** 31/07/2018
1. The revised MR and ER sheet[/15/] is checked, it is confirmed that the parameter of $MS\%_{BI,y}$ used for BE_{CH4} calculation has been listed in ER sheet and the determination of the value has been also explained in the MR. Via checking the Comprehensive baseline survey records[/29/] against the PoA validation report, it is confirmed that the determination of the parameter of $MS\%_{BI,y}$ is correct and actual. 2. The revised MR is checked, it is confirmed that the value of Households with proper sludge application and Number of households used for the specific calculation of baseline emissions of each CPA within				

this monitoring period is specified clearly, via checking the Survey list of the 200 samples[17], it is confirmed that these value used for calculation of BE_{CH4} is correct.
3. The revised MR and ER sheet[15] is checked, it is confirmed that the calculation process of BE_{CH4} and BE_{CO2} in ER sheet is in line with the latest approved PoA DD and CPA DDs and results are correct.

CAR ID	11	**Section no.**	F.2	**Date:** 13/07/2018
Description of CAR				
In MR version 1, Section F.2, for the calculation of project emission, 1. For the calculation of PE_{CH4}, the value of Households with proper sludge application used for the specific calculation of project emissions of each CPA within this monitoring period is not specified. 2. The calculation process of PE_{CH4} and PE_{CO2} in ER sheet is not correct, thus the results are not correct in both ER sheet and MR.				
CME response				**Date:** 30/07/2018
1. Revised. See MR (v2). *Households with proper sludge application: To exclude households without proper sludge application, the baseline emissions are multiplied with the monitoring parameter "Proper Sludge Application". During this monitoring period, 100% of sampled households have proper sludge application.* 2. Revised in the MR and ER sheet. See MR (v2) and ER sheet (v2). The uncertainty factor 1.12 has been accounted for twice wrongly in the calculation formula of project emissions. One 1.12 has been deleted.				
Documentation provided by the CME				
MR (version 2)[2] Survey list of the 200 samples[17] Emission Reduction Calculation spreadsheet (version 2)[15]				
DOE assessment				**Date:** 31/07/2018
1. The revised MR is checked, it is confirmed that the value of Households with proper sludge application and Number of households used for the specific calculation of baseline emissions of each CPA within this monitoring period is specified clearly, via checking the Survey list of the 200 samples[17], it is confirmed that these value used for calculation of BE_{CH4} is correct. 2. The revised MR and ER sheet[15] is checked, it is confirmed that the calculation process of PE_{CH4} and PE_{CO2} in ER sheet is in line with the latest approved PoA DD and CPA DDs and results are correct.				

CAR ID	12	**Section no.**	F.4	**Date:** 13/07/2018
Description of CAR				
In MR version 1, Section F.4, for the calculation of emission reductions, the calculation process of BE and PE in ER sheet is not correct, thus the calculation results of emission reductions are not correct in both ER sheet and MR.				
CME response				**Date:** 30/07/2018
Revised in the MR and ER sheet. See MR (v2) and ER sheet (v2).				
Documentation provided by the CME				
MR (version 2)[2] Emission Reduction Calculation spreadsheet (version 2)[15]				
DOE assessment				**Date:** 31/07/2018
The revised MR and ER sheet[15] is checked, it is confirmed that the calculation process of BE_{CH4} and BE_{CO2}, PE_{CH4} and PE_{CO2} in ER sheet is in line with the latest approved PoA DD and CPA DDs and results are correct. Hence, the calculation result of emission reductions is verified as correct.				

CAR ID	13	**Section no.**	F.6	**Date:** 13/07/2018
Description of CAR				
In MR version 1, Section F.6, for the remarks on difference from estimated value in included CPA, as the ER calculation result is not correct in ER sheet and MR, thus the comparison result with ex ante ER value in included CPA-DDs is not correct.				
CME response				**Date:** 30/07/2018
Revised in the MR and ER sheet. See MR (v2) and ER sheet (v2). *The actual value achieved during this monitoring period is 816,778 tCO_2e, which is 6.77% less than values (876,123 tCO_2e) estimated according to the registered PoA-DD and CPA-DDs.*				
Documentation provided by the CME				
MR (version 2)[2] Emission Reduction Calculation spreadsheet (version 2)[15]				

DOE assessment	Date: 31/07/2018
The MR is checked as revised, after revision, it is verified that the actual value achieved during this monitoring period is 816,778 tCO_2e, which is 6.77% less than values (876,123 tCO_2e) estimated according to the registered PoA-DD and CPA-DDs. Hence, it is confirmed that the ex-post determined value was found to be proportionally lower than the ex-ante estimated value. No further justification or explanation is deemed required as actual emissions of this MP do not exceed the ex-ante calculated emission reductions.	

Table 4. FARs from this verification

FAR ID	xx	Section No.		Date: DD/MM/YYYY
Description of FAR				
CME response				**Date:** DD/MM/YYYY
Documentation provided by the CME				
DOE assessment				**Date:** DD/MM/YYYY

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Document information

Version	*Date*	*Description*
02.0	29 December 2017	Revision to align with the requirements of the "CDM validation and verification standard for programme of activities" (version 01.0).
01.0	5 June 2015	Initial publication.

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