MONITORING REPORT

METHANE RECOVERY PROJECT HOUBENSTEYN YSSELSTEYN, LIMBURG, THE NETHERLANDS

everi

Project title	Methane Recovery Project Houbensteyn Ysselsteyn, Limburg, The Netherlands
Project ID	Verra Project ID 336
Monitoring period	01-January-2022 to 31-December-2022
Original date of issue	05-November-2023 is the date the monitoring report was completed following the completion of the audit.
Most recent date of issue	19-December-2024 is the date on which the document was most recently submitted
Version	5
***VCS Standard* Version**	4.7
Prepared by	everi GmbH

CONTENTS

PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Methane Recovery Project Houbensteyn Ysselsteyn, Limburg, the Netherlands (hereafter referred to as project Houbensteyn) is a methane recovery project through controlled anaerobic digestion from animal manure as well as from agricultural and industrial waste, that takes place on the estate of the project Houbensteyn Milieu BV located in the Province of Limburg, the Netherlands. The project activity involves power generation using Combined Heat and Power engines (CHP) to produce electricity and heat with the biogas generated. Furthermore, the project activity mitigates GHG emissions by replacing fossil fuels with decentral renewable thermal energy.

The current report monitors emission reductions that have occurred during the second crediting period from January 1st, 2022 to December 31st, 2022. During this period, 4 CHPs with a total electrical capacity of 1,7 MW were in operation and produced around 4,2 million m^3 of biogas. The project is under continuous operation since the commissioning of the first CHP in 2006.

The heat produced by the biogas plant is used for the own biogas production process, but also to substitute fossil fuels for heating pig stalls and office buildings, for preheating piglet food as well as for hygienization of digestate.

The total GHG emission reductions due to the project activity generated under the current monitoring period starting from 01/01/2022 to 31/12/2022 amounts to 15,201 t CO_2e.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	25-August-2007	VCS	TÜV Rheinland Group	-
Verification	01-May-2006 – 31-December 2007	VCS	TÜV Rheinland Group	1,6
Verification	01-January-2008 – 30-April-2016	VCS	Aenor International S.A.U.	8,3
Verification	01-May-2016 – 31-December-2021	VCS	Carbon Check (India) Private Ltd.	5,6

Verification	01-January-2022 – 31-December 2022	VCS	KBS Certification Services LTD	1

1.3 Sectoral Scope and Project Type

Sectoral scope[1]	1. Energy (renewable/non-renewable)
Project activity type	Fuel replacement

Sectoral scope[2]	13. Waste handling and disposal
Project activity type	Methane avoidance

1.4 Project Proponent

Organization name	Houbensteyn Milieu BV
Contact person	Martin Houben
Title	Owner and Managing Director
Address	Ysselsteynseweg 69, 5813 BK, Ysselsteyn Limburg - The Netherlands
Telephone	+ 31 6 532 11 287
Email	Martin.houben@hgroep.nl

1.5 Other Entities Involved in the Project

Organization name	everi GmbH
Role in the project	Carbon consultant, author of the Project Description report

[1] *Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes*

Contact person	Pauline Kalathas
Title	Senior carbon project developer
Address	Grosse Theaterstrasse 14, 20354 Hamburg, Germany
Telephone	+49 176 206 49 79 2
Email	pauline.kalathas@everi-climate.com

1.6 Project Start Date

Project start date	01-May-2006
Justification	Start of commissioning of the first CHP

1.7 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☐ Ten years, fixed ☒ Other (10 years crediting period which may be renewed at most twice, according to VCS Standard V3.7, section 3.8.1)
Start and end date of first or fixed crediting period	01-May-2016 to 30-April-2026

1.8 Project Location

The project activity takes place on the estate of the project owner Houbensteyn Milieu BV in Ysselsteyn, Limburg, southeastern part of the Netherlands. The geographical coordinates are N 51° 29’ 40.633” E 5° 55’ 48.705”.

Figure 1: Map of The Netherlands with marked project location

Figure 2: Area map with project location

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	AMS III.AO	Methane recovery through controlled anaerobic digestion	1.0
Methodology	AMS III.D	Methane recovery in agricultural and agro-industrial activities	21

Methodology	AMS I.C	Thermal energy production with or without electricity	21

The methodologies also refer to the latest approved version of the following tool:

- Project and leakage emissions from anaerobic digesters, Tool 14 (Version 02)

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☒ Yes ☐ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☒ Yes ☐ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through the Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."

☒ Yes ☐ No

The public statement as written above was posted in Dutch on the project proponent's website under *https://www.houbensteyngroep.nl/groene-energie/* :

1.12 Sustainable Development Contributions

The implementation of a biogas installation with manure and co-substrate treatment as well as renewable electricity and thermal energy production helps to avoid the release of methane and CO_2 emissions into the atmosphere. This contributes to the Netherland's targets of reducing GHG emissions by 95% by 2050, reducing carbon emissions by 49% in 2030[3] and achieving a share of 27% share of renewable energy by 2030, as outlined in the Dutch Climate Act[4].

[3] Fifth Dutch National SDG Report, p. 19, https://www.sdgnederland.nl/wp-content/uploads/2021/08/Dutch-National-SDG-Report-2021.pdf

[4] Integrated National Energy and Climate Plan (2021-2030), p. 7 and p. 9, https://energy.ec.europa.eu/system/files/2020-03/nl_final_necp_main_en_0.pdf

The project also contributes to achieving sustainable development by creating local and green jobs and providing direct and indirect employments during the construction and operational phases[5].

[5] Energieakkoord, p. 11, point 5, https://www.ser.nl/nl/thema/energie-en-duurzaamheid/energieakkoord/-/media/5A6DE312EAB948BEADF43DECF2DF5669.ashx and

https://climate-laws.org/geographies/netherlands/policies/energy-accord-for-sustainable-growth-energieakkoord and

https://www.government.nl/documents/publications/2013/09/06/energy-agreement-for-sustainable-growth (Download "Energy Agreement for Sustainable Growth")

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	The operation of the biogas plant has generated 8,9 GWh of renewable electricity and at least 10 GWh of renewable heat during the current monitoring period, which increase the share of renewable energy related to the total primary energy supply.	The project will increase the generation of renewable electricity by around 140 GWh and at least 91 GWh of heat over the project lifetime, contributing to Netherland's targets to increase the share of renewable energy in the global energy mix.

2)	8.1	8.1.1 Annual growth rate of real GDP per capita	Implemented activities to increase	Direct employments (1 full-time and 2 part-time jobs for operation and administration of the plant) and indirect employments (4 jobs for substrate transport and the application of digestate on the fields) in order to achieve the goal of sustainable and equitable economic growth for workers and contribute to the Dutch government's goal of creating 15 thousand full-time jobs in the renewable energy sector.	Creation of direct employments (1 full-time and 2 part-time jobs for operation and administration of the plant) and indirect employments (4 jobs for substrate transport and the application of digestate on the fields) in order to achieve the goal of sustainable and equitable economic growth for workers and contribute to the Dutch government's goal of creating 15 thousand full-time jobs in the renewable energy sector
3)	13.2	13.2.2 Total greenhouse gas emissions per year	Implemented activities to decrease	By running the biogas plant, around 15 thousand tons of GHG emissions were avoided through project activity during the monitoring year 2022.	Prevented the release of 210 thousand tons of carbon into the atmosphere

1.13 Commercially Sensitive Information

There is no information which has been excluded from the public version of the monitoring report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

The stakeholder make up has not changed since the registration.

Stakeholder Identification	This agricultural plant has been in operation since 2006 on the estate of the project owner, providing renewable energy, a nutrient rich digestate and avoiding GHG emissions from manure storage and fossil fuels. Stakeholders have been identified since the initiation of the project, primarily through informal processes integrated into daily operations. This includes both direct and indirect stakeholders: • Direct Stakeholders: Local community members/neighbors living near the plant, project employees, and suppliers of biomass (such as farmers who provide manure) • Indirect Stakeholders: Local and regional governments, environmental organizations, renewable energy purchasers, business partners, and visitors to the plant.
Legal or customary tenure/access rights	The project is located on the estate owned by Houbensteyn Milieu BV in the Netherlands. The land is privately owned, and there are no conflicting rights or collective land claims on the project area. All legal requirements concerning land ownership and operation rights have been fully complied with. The project area is not subject to Indigenous People's customary rights or any local community rights as it is fully within the privately owned boundaries of Houbensteyn Milieu BV.

	Furthermore, all required permits for biogas operations, biomass storage, and energy generation have been obtained from the relevant Dutch authorities, ensuring legal compliance. There are no customary access rights that conflict with the project activities, as it is entirely operated on private land.
Stakeholder diversity and changes over time	The stakeholder groups involved in the project include local farmers (biomass suppliers), employees, nearby community members, business partners, and local authorities. There is a degree of social and economic diversity among these stakeholders: • Local Farmers: Economically diverse, with varying levels of dependency on the project for manure recycling. • Local Community Members: A mix of homeowners, business owners, and tenants who may benefit from reduced odor and cleaner waste management. • Employees and Business Partners: These groups contribute different levels of technical expertise and operate at varying scales of business involvement. Over time, the diversity among stakeholders has evolved due to improvements in technology and increased collaboration with renewable energy buyers. The interactions between stakeholders have remained positive, with the farmers continuing to supply manure and benefiting from nutrient-rich digestate, and the community seeing environmental benefits from reduced emissions and odors.
Expected changes in well-being	The expected changes in stakeholder well-being due to the project include: • Local Farmers: Benefit from the disposal of manure and access to nutrient-rich digestate as a by-product of the biogas process, which can be used as an organic fertilizer.

	• Local Community Members: Expected improvements in well-being are linked to reduced greenhouse gas emissions, better air quality due to managed manure, and reduced odor. These contribute to a cleaner local environment. • Local Government: Gains from reduced GHG emissions, supporting local sustainability initiatives. The project also contributes to renewable energy generation, which benefits the broader community. • Employees: Continued employment opportunities in renewable energy operations, contributing to local economic stability. The overall impact is positive, with enhanced environmental quality, economic benefits to farmers, and contributions to renewable energy efforts. There are no anticipated negative impacts on well-being for any stakeholders identified.
Location of stakeholders	The stakeholders are primarily located in the immediate vicinity of the project site in the Netherlands. This includes local community members living near the biogas plant, local farmers who supply biomass, and project employees. Local and regional governments, as well as business partners, are located within the region, while environmental organizations and renewable energy purchasers may operate more broadly but have a vested interest in the project outcomes. There are no indigenous peoples or customary rights holders affected, as the project is fully contained on privately owned land.
Location of resources	The resources used for the project are primarily sourced both regionally and from other parts of the Netherlands. Manure is supplied by local farmers, while agricultural and industrial waste is provided by various companies across the country, ensuring a steady and reliable supply of biomass. The land used for the biogas plant is privately owned by Houbensteyn Milieu BV. There are no shared resources or territories to which stakeholders have customary access. All activities are confined to the

	property of Houbensteyn Milieu BV, ensuring clear ownership and control of the resources involved in the project.

2.1.2 Stakeholder Consultation and Ongoing Communication

The Project is registered with VCS as VCS ID 336. The Local Stakeholder Consultation process was already conducted in line with the requirements during the project registration. As during the authorization process for the project, public stakeholders have the right to litigate against the project at the administrative court during the operation phase of the biogas plant in case the installation has a negative impact on their well-being. In the same way, public stakeholders have the possibility to contact directly and at any time the company of Houbensteyn Milieu BV in case they feel directly or indirectly disturbed by the project activity.

Ongoing consultation	Houbensteyn Milieu BV is committed to maintaining open lines of communication with stakeholders through regular engagement and transparency. The biogas plant actively facilitates dialogue with local communities, business partners, and other interested parties as part of daily operations. Additionally, the project is showcased during on-site visits, emphasizing renewable energy production and improved manure management practices. Approximately 10 times a year, Houbensteyn Milieu BV hosts various stakeholder groups—including local communities, farmers, customers, auditors, government officials, and others—to provide insight into the operations of the biogas plant. These visits serve multiple purposes, such as: • Providing local communities with a firsthand look at the ongoing projects on the plant site and creating opportunities for discussion. • Informing arable farmers about the types of products used in the process so they understand what they will receive as fertilizer after digestion.

- Educating schools and students on the fermentation process.
- Collaborating with Houbensteyn's study network, which includes other biogas plant owners and company employees, to exchange knowledge and explore the efficient operation of the plant.
- Demonstrating in general how organic feedstock is transformed into renewable energy.

For example, the deputy of the Province of Limburg, Geert Gabriëls, visited the biogas plant in 2022 to better understand its impact on regional sustainability and to show his support for sustainable energy initiatives in the region. As the deputy responsible for Nature, Environment, Nitrogen Management, and Cultural Heritage, Geert Gabriëls plays a key role in shaping agricultural and environmental policies in Limburg. His responsibilities include overseeing nitrogen reduction initiatives, promoting biodiversity, and ensuring sustainable land use practices, all of which align closely with the efforts of the biogas plant. During his visit, he highlighted the importance of such projects in reducing emissions and promoting renewable energy, crucial components of the province's sustainability strategy. During his visit, Geert Gabriëls engaged in discussions about the biogas plant's role in renewable energy production and its contributions to manure management and environmental conservation. He expressed particular interest in the plant’s approach to reducing regional nitrogen emissions, highlighting its importance in achieving provincial sustainability goals. The visit underscored the plant’s significance in fostering renewable energy while maintaining strong ties with the local community and stakeholders.

Overall, stakeholder engagement at Houbensteyn Milieu BV is often informal and occurs through day-to-day interactions, led primarily by Martin Houben. This ongoing dialogue strengthens relationships with local communities, business partners, and other stakeholders, ensuring a continuous, community-based approach to managing the plant’s environmental impact and operations.

Date(s) of stakeholder consultation	10 times/year
Communication of monitored results	The PP is orally communicating with the stakeholders. PP meets regularly business partners or neighbors due to the daily business. In addition, the project is presented during on-site visits to stakeholders in order to inform about renewable energy production and improved manure management.
Consultation records	Communication with project stakeholders occurs orally
Stakeholder input	Since the biogas installation impacted positively the region on an economical, environmental and a social level, the stakeholders still give till today positive feedback and consider the project as an example that can motivate other communities to generate renewable energies using the local manure and this way reducing the GHG emissions as well as odor. No complain or litigation has taken place during monitoring period.

2.1.3 Free, Prior, and Informed Consent

Consent	Initial stakeholder consultation has been conducted in 2007 in line with Section 3.18 of the VCS Standard.
Outcome of FPIC	According to the first PD “All stakeholders were informed and had the chance to comment on this project and – if desired – litigate against the project at the administrative court. No such action was taken whatsoever. Whenever stakeholders gave feedback it was very positive due to the advantageous economical and environmental consequences of the project to the region, the local economy, population and society. Several stakeholders were convinced that this project will motivate other communities throughout and even beyond the region to build similar manure utilizing biogas plants. Further, discussions with local representatives have resulted in a commitment of full support for the project.”

2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
No grievances raised during the monitoring period 2022	-

2.1.5 Public Comments

Summary of comments received	Actions taken
No comments received during the monitoring period 2022	-

2.2 Risks to Stakeholders and the Environment

	Risk identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified	Stakeholder can contact the PP or access the project site any time.
Working conditions	No risk identified	In the Netherlands, labor laws and regulations are robust and aim to ensure fair and safe working conditions for all employees. These laws cover aspects such as working hours, wages, breaks, and safety standards. The project complies with these regulations to ensure the well-being of their workers.
Safety of women and girls	No risk identified	Dutch laws prohibit discrimination based on gender, ensuring that women and girls are equally protected in the workplace. Additionally, there are specific regulations to prevent harassment and ensure a safe working environment for all employees, regardless of gender.
Safety of minority and marginalized groups, including children	No risk identified	The Netherlands has regulations in place to protect the rights and safety of minority and marginalized groups, including immigrants and

		refugees, in the workplace. These regulations ensure equal opportunities and fair treatment for all employees, regardless of their background.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	No risk identified	Child labor is strictly prohibited in the Netherlands, in line with international conventions and Dutch laws. There are strict regulations regarding the minimum age for employment and the types of work that minors can undertake.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	Dutch laws strictly prohibit discrimination and sexual harassment in the workplace. The Dutch Equal Treatment Act (Algemene Wet Gelijke Behandeling) ensures that all employees are treated fairly and equally, regardless of their gender, race, sexual orientation, religion, or any other characteristic. Employers are required to take measures to prevent discrimination and harassment, including implementing policies, providing training, and establishing procedures for reporting and addressing complaints. No complaints have ever been raised regarding discrimination and sexual harassment during the entire project activity.
Management experience	No new entity has recently been involved in project design or implementation.
Gender equity in labor and work	Gender equity is a fundamental principle in Dutch labor law and practice. The Netherlands has strong policies and initiatives aimed at promoting gender equality in the workplace, including equal pay for equal work, measures to address gender-based discrimination and harassment, and support for work-life balance. Employers are expected to create inclusive and diverse work environments where all employees, regardless of gender, have equal opportunities for advancement and career development.

Human trafficking, forced labor, and child labor	The Netherlands has stringent laws and regulations to combat human trafficking, forced labor, and child labor. These include the Dutch Criminal Code (Wetboek van Strafrecht), which criminalizes human trafficking and forced labor, and the Dutch Child Labor Act (Wet arbeid door kinderen), which prohibits child labor and sets minimum age requirements for employment. Employers are legally obligated to ensure that their operations do not involve any form of exploitation or coercion, and they may face severe penalties for non-compliance.

2.3.2 Human Rights

Please refer to section 2.2.

2.3.3 Indigenous Peoples and Cultural Heritage

n.a.

2.3.4 Property Rights

Disputes over rights to territories and resources	N/A.
Respect for property rights	N/A.

2.3.5 Benefit Sharing

The project does not impact property rights.

2.4 Ecosystem Health

The Houbensteyn project has been formally and finally approved by the responsible regional authorities of the Netherlands in accordance with the Dutch building law “Wet op de Ruimtelijke Ordening”. This act provides the set of rules which regulates the impact assessment of plants or projects on the environment. The approval covers the installation and operation of the biogas power plant including all components such as storage, feeders, fermenters, CHP modules, etc.

The project activity contributes to a significant higher ecological sustainability compared to a reference scenario without manure’s treatment by using biogas plants.

Hence, the Houbensteyn project has no relevant negative environmental and socio-economic impacts and contributes positively by providing environment friendly power generation leading to sustainable development of the region as.

	Risk identified	Mitigation or preventative measure(s) taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified.	The biogas plant has been fully assessed through an environmental impact assessment (EIA) and has obtained the required building permits, ensuring compliance with all relevant environmental and safety standards. The project is operational, which implies that it meets all necessary regulatory requirements without posing any risk to biodiversity and ecosystems.
Soil degradation and soil erosion	No risk identified	The biogas plant has been fully assessed through an environmental impact assessment (EIA) and has obtained the required building permits, ensuring compliance with all relevant environmental and safety standards. The project is operational, which implies that it meets all necessary regulatory requirements without posing any risk to soil degradation and soil erosion.
Water consumption and stress	No risk identified	The biogas plant has been fully assessed through an environmental impact assessment (EIA) and has obtained the required building permits, ensuring compliance with all relevant

[redacted]		environmental and safety standards. The project is operational, which implies that it meets all necessary regulatory requirements without posing any risk to water consumption and stress.

2.4.1 Rare, Threatened, and Endangered species

The project is not located in, or adjacent to habitats for rare, threatened, or endangered species.

2.4.2 Introduction of species

n.a.

2.4.3 Ecosystem conversion

n.a.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

During the monitoring period (1st of January to 31st of December 2022) the project activity was in continued operation.

CHP Units	Electric capacity installed	Thermal capacity installed	Electric efficiency [FT]	Start of operation date
	kWel	kWth	%	
CHP 1 - MAN LE 312	530	627	37.8	2016
CHP 2 - MAN LE 312	530	627	37.8	2016
CHP 3 - MAN LE 312	346	421	37.5	2006
CHP 4 - MAN LE 312	346	421	37.5	2009

Table 2: Data of installed CHP units from Houbensteyn Milieu BV

The biogas plant treats pig manure from the operator's own farm and from external farms located around the project site, which represent at least 50% of the total biomass fed. Co-ferments from agricultural and food industries are also delivered and fed to the biogas plant.

The plant has produced around 4 million m³ biogas during the current monitoring period.

Since the beginning of the crediting period, the waste heat of the CHPs has been used for space heating of the adjacent pig stalls and office building, as well as for preheating piglet food. Furthermore, since January 2007, heat is used for hygienization of the digestate.

During this monitoring period, the biogas plant has been running without any significant event that would have affected the GHG emission reductions and monitoring. Moreover, no changes with respect to new equipment, buildings or installations occurred in the monitoring period.

3.2 Deviations

3.2.1 Methodology Deviations

In this monitoring period, the methodologies are applied as described in the PDD under section 4, including the deviations mentioned in section 3.6., except for the parameters BGP (biogas production), x_{CH4} (methane content) and the calculation of the distance between external manure suppliers' location and the biogas site.

1. Biogas production

Deviant from the calculation method described in the PD, the amount of biogas is not calculated as described in section 3.6. on page 47 of the PD but calculated based on the biogas production of each substrate treated in the plant. This calculation was carried out by a third-party company Eqwadraat, which is the author of the mandatory electricity and heat measurement reports (see for example Appendix B "App B - 1 - Meetrapport 2022 - Houbensteyn Milieu" on page 4). Since the biogas production is not relevant for the quantification of GHG emission reductions, this deviation has no impact on their conservativeness.

2. Methane content

Regarding the methane content in the biogas, the calculation method presented in the PDD used for calculating the biogas production is applied instead of using literature values of methane content from all substrates treated in the plants. As described in the PDD under section 5.2 for parameter BGP, the calculation method used is:

$$BGP = \frac{EEP}{(ETA_{CHP-el}) * HV_{Biogas}}$$

Where:

BGP	Biogas produced [m³]

EEP	Electrical energy produced [MWh]
ETA_{CHP-el}	Electric efficiency of the CHP engines
HV_{Biogas}	Calorific value of biogas [kWh/m³]

With

$$HV_{Biogas} = 0,01 \frac{MWh}{m^3} \cdot x_{CH4}$$

Where:

0,01	Stoichiometric combustion calculation of CH4 [MWh/m³]:
	802,6 kJ/mol /0,02241 m³/mol = 35.814,37 kJ/m³ = 0,01 MWh/m³
x_{CH4}	CH4 volume content of biogas flow [%]

Since EEP is measured, BGP is calculated and ETA_{CHP-el} is given (see Appendix B "Data sheet MAN LE [no]"), the CH_4 content in the biogas can be calculated as per calculation method above. Since the biogas production is not relevant for the quantification of GHG emission reductions, this deviation has no impact on their conservativeness.

3. Manure transport distance

In the previous monitoring period (2016-2021) project emissions from manure transportation were accounted and calculated according to the PD Section 4.2. It was calculated that these emissions accounted for 0.19% of the total baseline emissions and, therefore, can be considered insignificant according to the „Guidance on criteria for baseline setting and monitoring, Version 03, §14 (a) iii", Joint Implementation Supervisory Committee (project emissions do not exceed the criterion for significance of 1% from baseline emissions)

Following the advice of the VVB from the last monitoring period and the fact that the supply structure of the project is largely unchanged in the monitoring period 2022 (cf. Appendix B "App B - 5 - 2022 AANGEVOERDE MEST HYS"), project emissions from manure transportation were excluded from the monitoring plan and neglected in the calculation of the emission reductions. This approach does not lead to an overestimation of the achieved emission reductions in the project, since the impact of project emissions from transport on the emissions reductions is negligible.

3.2.2 Project Description Deviations

No project description deviations have occurred.

3.3 Grouped Projects

Project activity is not a grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data and parameter from the AMS-III.D

Data / Parameter	GWP_{CH4}
Data unit	t CO_2e / t CH_4
Description	Global warming potential of methane applicable to the crediting period
Source of data	IPCC Fifth Assessment Report (AR5)
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	As per VCS Standard, Version 4.1, paragraph 3.14.4
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	-

Data / Parameter	D_{CH4}
Data unit	t CH_4/m^3
Description	Density of Methane
Source of data	UNFCCC
Value applied	0.00067
Justification of choice of data or description of measurement methods and procedures applied	Density of methane at room temperature (20°C) and at 1 atm pressure
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	-

Data / Parameter	U_{fb}
Data unit	-
Description	Model correction factor to account for model uncertainties
Source of data	AMS-III.D, Version 21.0; Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

Value applied	0.94
Justification of choice of data or description of measurement methods and procedures applied	As per AMS-III.D, Version 21.0
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	-

Data / Parameter	MCF_j
Data unit	%
Description	Annual methane conversion factor (MCF) for baseline pig manure management system j
Source of data	National Inventory Report 2021- Annex 7 Van der Zee (2021) – Methodology for estimating emission from agriculture in the Netherlands – Section 4.2.3, p. 54
Values applied	Manure type: Liquid pig manure; MCF_j: 36%
Justification of choice of data or description of measurement methods and procedures applied	A country specific value is available for pig manure. This value is used in the NIR for GHG emission calculations of the Netherlands.
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	-

Data / Parameter	$B_{0,LT}$
Data unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for animal type LT
Source of data	National Inventory Report 2021- Annex 7 Van der Zee (2021) – Methodology for estimating emission from agriculture in the Netherlands – Section 4.2.3, p. 54 (for liquid pig manure).
Values applied	Manure type: Liquid pig manure; Bo_{LT}: 0.31

Justification of choice of data or description of measurement methods and procedures applied	A country specific value is available for pig manure. This value is used in the NIR for GHG emission calculations of the Netherlands.
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	-

Data / Parameter	$MS\%_{i,y}$
Data unit	-
Description	Fraction of manure handled in system i in year y
Source of data	AMS-III.D
Values applied	100%
Justification of choice of data or description of measurement methods and procedures applied	The project activity does not involve sequential manure management systems. Hence, all manure will be handled in system i and a value of 100% is applied.
Purpose of Data	Calculation of project emissions
Comments	-

Data and parameter from AMS-I.C

Data / Parameter	$EF_{FF,CO2}$
Data unit	t CO_2/TJ
Description	CO_2 emission factor for natural gas
Source of data	The Netherlands: list of fuels and standard CO2 emission factors version of January 2022, Netherlands Enterprise Agency, p. 4[6].
Value applied	56.4
Justification of choice of data or description of measurement methods and procedures applied	Country specific values for natural gas are available and published on the governmental website from RVO (Netherlands Enterprise Agency)
Purpose of Data	Calculation of baseline emissions
Comments	-

[6] https://www.rvo.nl/sites/default/files/2023-08/The%20Netherlands%20list%20of%20fuels%20and%20standard%20CO2%20emission%20factors%20January%202022.pdf

Data / Parameter	$\eta_{BL,thermal}$
Data unit	%
Description	Efficiency of the plants using natural gas
Source of data	As per AMS-I.C, paragraph 42. c)
Value applied	100
Justification of choice of data or description of measurement methods and procedures applied	No data concerning the operational efficiency of the baseline units are available. Hence, a default efficiency value is used as per AMS-I.C
Purpose of Data	Calculation of baseline emissions
Comments	-

CapHeat	$Cap_{Heat,PR}$
Data unit	kWh/tonne
Description	Specific heat capacity of digestate
Source of data	"Biogashandbuch Bayern, 17.05.2007 (Trad: *Biogas manual Bavaria*), Section 1.7.8, p. 22.
Value applied	1.16
Justification of choice of data or description of measurement methods and procedures applied	The heat capacity of digestate to be heated up is set to the capacity of water. As described in the biogas manual, the specific heat capacity of water is set for biogas substrate.
Purpose of Data	Calculation of baseline emissions
Comments	-

CapHeat	$Cap_{Heat,BE}$
Data unit	kJ / kg K
Description	Specific heat capacity of manure
Source of data	Wikipedia
Value applied	4.18
Justification of choice of data or description of measurement methods and procedures applied	The heat capacity of the manure to be pre-heated is set to the capacity of water 4,18 kJ/kg K
Purpose of Data	Calculation of baseline emissions

Comments	-

CapHeat	$T_{Hyg,PR}$
Data unit	°C
Description	Outlet temperature of digestate in the project activity
Source of data	
Value applied	75
Justification of choice of data or description of measurement methods and procedures applied	The special treatment process to sanitize digestate for export needs for 1 hour a temperature above 70°C
Purpose of Data	Calculation of baseline emissions
Comments	For conservativity reasons, a temperature of 75°C was set as the sanitization process is set to 73°C and it does not exceed 75°C.

CapHeat	$T_{Hyg,BE}$
Data unit	°C
Description	Outlet temperature of manure in the baseline scenario
Source of data	-
Value applied	70
Justification of choice of data or description of measurement methods and procedures applied	The special treatment process to sanitize manure for export needs for 1 hour a temperature above 70°C
Purpose of Data	Calculation of baseline emissions
Comments	For conservativity reasons, a temperature of 70°C was set as 70°C represents the lowest temperature required for the sanitization process.

CapHeat	$T_{Inlet,PR}$
Data unit	°C
Description	Inlet temperature of digestate to the hygienization system in the project activity
Source of data	-
Value applied	37

Justification of choice of data or description of measurement methods and procedures applied	The temperature in the digesters varies between 37 °C – 41 °C to guarantee the survival of the bacterial cultures. For conservativity reasons, the digestate temperature is set to 37 °C.
Purpose of Data	Calculation of baseline emissions
Comments	For conservativity reasons, a temperature of 37 °C was set as this represents the lowest temperature for digestate, since the usual temperature in the fermenter fluctuates between 37 °C - 41 °C.

CapHeat	$T_{Inlet,BE}$
Data unit	°C
Description	Inlet temperature of manure to the hygienization system in the baseline scenario
Source of data	World Weather Online, https://www.worldweatheronline.com/lang/es/wanroij-weather-averages/north-brabant/nl.aspx
Value applied	10.8
Justification of choice of data or description of measurement methods and procedures applied	Value set to the average annual ambient temperature in the region of Wanroij, North Brabant
Purpose of Data	Calculation of baseline emissions
Comments	-

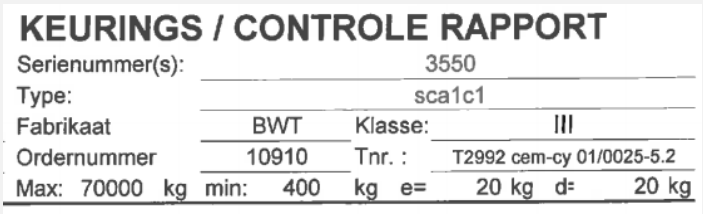
CapHeat	$Eff_{ex,PR}$
Data unit	%
Description	Heat exchanger efficiency of the hygienization unit in the project activity
Source of data	As per AMS-I.C, Appendix 1
Value applied	87
Justification of choice of data or description of measurement methods and procedures applied	No data concerning the operational efficiency of the hygienization unit is available. Hence, a default efficiency value is used as per AMS-I.C
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	ETA_{CHP-el}
Data unit	%
Description	CHP electrical efficiency
Source of data	Technical specification of the CHP
Value applied	**CHP Units** / **Electric efficiency** / **%** CHP 1 - MAN LE 202 / 37.8 CHP 2 - MAN LE 202 / 37.8 CHP 3 - MAN LE 312 / 37.5 CHP 4 - MAN LE 312 / 37.5
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	To cross-check the biogas produced and destroyed by the CHP engines
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	$Q_{fm,j,LT,y}$
Data unit	kg/y, fresh basis
Description	Quantity of fresh manure treated from livestock type LT at animal manure management system j
Source of data	Manure quantities from external farms are recorded in the company's database as well as in the official software of the government Dutch National Service for Enterprise (Rijksdienst voor Ondernement RVO), that records all the nutrients shifts and flows between farms under mijn.rvo.nl. Manure quantities from own farms are calculated as the difference between the amount of digestate sold and the

<table>
<tr><td></td><td>amount of co-ferment inputs. Digestate and co-ferments amounts are also registered in the RVO database.</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>Quantity of manure supplied by external farms is weighed when delivered by a truck weighing scale.

Quantity of manure supplied by Houbensteyn Ysselsteyn are calculated as the difference between the amount of digestate sold and the amount of co-ferment inputs. The amounts of digestate and co-ferment inputs are measured by weighing scale and recorded daily in operation manual and in electronic databases.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Annually, based in daily measurements</td></tr>
<tr><td>Value applied</td><td>
<table>
<tr><td>Liquid pig manure from Houbensteyn farms</td><td>Quantity [kg/y]</td></tr>
<tr><td>2022</td><td>35,720,660</td></tr>
</table>
<table>
<tr><td>Liquid pig manure from ext. farms</td><td>Quantity [kg/y]</td></tr>
<tr><td>2022</td><td>55,470,670</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>Specifications of the weighing scale on the installation:
 
KEURINGS / CONTROLE RAPPORT
Serienummer(s): 3550
Type: sca1c1
Fabrikaat BWT Klasse: III
Ordernummer 10910 Tnr. : T2992 cem-cy 01/0025-5.2
Max: 70000 kg min: 400 kg e= 20 kg d= 20 kg

The date of the last calibration report before this monitoring period is from 06.10.2020.</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Weighing scales are precise and belong to the accuracy class III. Calibration occurs when the devices need maintenance or repairs. Since substrates are not only weighed when being delivered on the biogas plant but also at the supplier’s location, the PP controls continuously the accuracy of the weighed substrates by comparing both weighing results. This practice ensures for both parties that substrate measurements are accurate. In case of deviations, the PP gets in contact with the manufacturer so that the weigh bridge can be repaired and calibrated. No incident of malfunction of the weigh bridge occurred during this monitoring period.</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions and project emissions</td></tr>
</table>

Calculation method	Manure from own farms [t/y] = Digestate sold [t/y] - Co-ferment inputs [t/y]
Comments	Manure amounts treated in the biogas plant vary from year to year, depending on the manure availabilities in the region. The calculation method for the quantities of manure delivered by Houbensteyn Ysselsteyn is the same as in the first crediting period and is considered to be very conservative, as it does not take into account the weight loss due to dissolved biogas.

Data / Parameter	$dm_{j,LT,y}$
Data unit	kg dm/kg fresh manure
Description	Dry matter content of animal manure from livestock type LT and animal manure management system j in year y
Source of data	Dry matter content analyses from specialized accredited laboratories as Eurofins and Normec Robalab
Description of measurement methods and procedures to be applied	For manure delivered by the Houbensteyn farms: Pig manure samples from all Houbensteyn farms, Aben farms (VCS Project ID 335) and Princepeel farms (VCS Project ID 337) have been sent to laboratories to measure the respective dry matter content. For manure delivered by external farms: The average dry matter content of the annually aggregated measured dm values from the Houbensteyn, Aben and Princepeel farms is multiplied by 90% in order to obtain the value used for dry matter content.
Frequency of monitoring/recording	Twice a year
Value applied	

Manure from Houbensteyn farms	Average dry matter content [kg dm/kg]
Pig manure	0,117

Manure from ext. farms	Average dry matter content [kg dm/kg]
Pig manure	0,105

Monitoring equipment	Laboratories analyses
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions and project emissions
Calculation method	For manure delivered by the Houbensteyn farms: Average annual dm value calculated based on all dm results from manure measurements on Houbensteyn farms, Aben farms (VCS Project ID 335) and Princepeel farms (VCS Project ID 337). For manure delivered by external farms: Average annual dm value [kg dm/kg] x 90%
Comments	-

Data / Parameter	$SVS_{j,LT,y}$
Data unit	kg SVS/kg dm
Description	Organic dry matter content (odm=specific volatile solids content) of animal manure from livestock type LT and animal manure management system j in year y
Source of data	Organic dry matter content analyses from specialized accredited laboratories as Eurofins and Normec Robalab
Description of measurement methods and procedures to be applied	For manure supplied by the Houbensteyn farms: Pig manure samples from all Houbensteyn farms, Aben farms (VCS Project ID 335) and Princepeel farms (VCS Project ID 337) have been sent to laboratories to measure the respective organic dry matter content. For manure supplied by external farms: The average organic dry matter content of the annually aggregated measured odm values from Houbensteyn, Aben and Princepeel farms is multiplied by 90% to obtain the value used for organic dry matter content.
Frequency of monitoring/recording	Twice a year

Value applied	<table><tr><td>Manure from Houbensteyn farms</td><td>Organic dry matter content [kg/kg]</td></tr><tr><td>Liquid pig manure</td><td>0.773</td></tr></table> <table><tr><td>Manure from ext. farms</td><td>Organic dry matter content [kg/kg]</td></tr><tr><td>Liquid pig manure</td><td>0.696</td></tr></table>
Monitoring equipment	Laboratories analyses
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions and project emissions
Calculation method	For manure delivered by the Houbensteyn farms: Average annual odm value calculated based on all odm results from manure measurements on Houbensteyn farms, Aben farms (VCS Project ID 335) and Princepeel farms (VCS Project ID 337) For manure delivered by external farms: Average annual odm value [kg SVS/kg dm] x 90%
Comments	

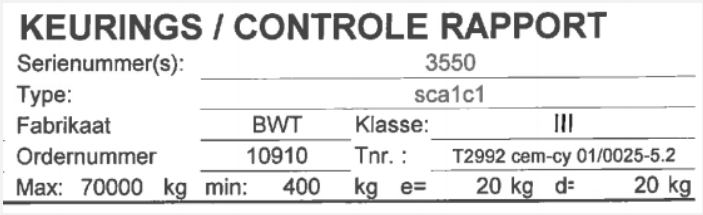
Data / Parameter	$Heat_{tot,y}$
Data unit	Gj
Description	Quantity of thermal energy consumption for total external heat use during the year y
Source of data	Heat meter
Description of measurement methods and procedures to be applied	The heat use is measured by a heat meter and recorded digitally in annual measurement reports (Appendix B “App B - 1a - Meetrapport 2022 - Houbensteyn Milieu”). The daily measurements are recorded and send both monthly and annually to CertiQ (the Dutch issuing body for guarantees of

<table>
<tr><td></td><td>origin and certificates of origin for heat and electricity generated from sustainable sources) for certification.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Annually, based on monthly reports</td></tr>
<tr><td>Value applied</td><td>
<table>
<tr><th>Year</th><th>Heat consumption [Gj/y]</th></tr>
<tr><td>2022</td><td>38,126</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>Specifications of the heat meters, their technical devices and calibration information (Source: App B – 7 – Meetprotocol, on page 9 and attachement):

Translation:

<table>
<tr><th>Meter #</th><th>Heat type</th><th>Unit</th><th>Model</th><th>Measurement of</th><th>Accuracy level</th><th>Meets requirements</th><th>Calibration dates</th></tr>
<tr><td>1</td><td>Warm water</td><td>GJ</td><td>Kamstrup MC801, Ultraflow65</td><td>Flow return, Temperature supply, Temperature return</td><td>Flow sensor: 0,25%
Temperature sensor:0,65%
Calculation module: 0,15%</td><td>Yes</td><td>Multical MC801 67LU207B1285 13.08.2016</td></tr>
</table>
</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>The electric and heat meters are supplied, installed, and operated by a recognized measuring company Fudura B.V. Fudura reads, collects and validates the necessary measurement data and send the data to the grid operator. Fudura also takes care of the control and maintenance of the meter. The meters are operated, maintained and calibrated according to the manufacturer’s instructions.

Heat measurements are carried out in accordance with the applicable rules described in the regulations in the Standards Framework for Metering Companies and the Meter Pool Regulations. Fudura has a certified data collection, validation and distribution system EDS (data management system). EDS is certified according to the ISO 9001-2008 standard. The values are checked against historical data, key figures and related to the operation mode. In case measurement data is not plausible after checking, the measurement data is re-collected and validated. In case a measurement fails, it is reported to the malfunction department, which identifies the cause and fixes the problem (see App B – 7 – “Meetprotocol Houbensteyn BV”).</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Calculation method</td><td>-</td></tr>
<tr><td>Comments</td><td>The operator has not the possibility to access or manipulate the meters as they are sealed by officials (Fudura B.V.).</td></tr>
</table>

<table>
<tr><td>Data / Parameter</td><td>Digestate</td></tr>
<tr><td>Data unit</td><td>kg</td></tr>
<tr><td>Description</td><td>Quantity of digestate (output substrate from the biogas plant) during the year y</td></tr>
<tr><td>Source of data</td><td>Electronic database provided by the governmental agency RVO under mijn.rvo.nl. and measurements reports certified by CertiQ (Appendix B “2022 Uitgaande Mest Hys”)</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>Measured by truck weighing scale after digestion process</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>At collection</td></tr>
<tr><td>Value applied</td><td><table><tr><th>Year</th><th>Digestate quantity [kg/y]</th></tr><tr><td>2022</td><td>105,390,330</td></tr></table></td></tr>
<tr><td>Monitoring equipment</td><td>Specifications of the truck weighing scale on the installation:
 
KEURINGS / CONTROLE RAPPORT
Serienummer(s): 3550
Type: sca1c1
Fabrikaat BWT Klasse: III
Ordernummer 10910 Tnr. : T2992 cem-cy 01/0025-5.2
Max: 70000 kg min: 400 kg e= 20 kg d= 20 kg

The date of the last calibration report before this monitoring period is from 06.10.2020</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Calibration occurs when the devices need maintenance or repairs. Since substrates are not only weighed when being delivered on the biogas plant but also at the supplier’s location, the PP controls continuously the accuracy of the weighed substrates by comparing both weighing results. This practice ensures for both parties that substrate measurements are accurate. In case of deviations, the PP gets in contact with the manufacturer so that the weigh bridge can be repaired and calibrated.</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Calculation method</td><td>-</td></tr>
</table>

Comments	-

Data / Parameter	EEP
Data unit	kWh
Description	Electrical energy produced
Source of data	Power meter
Description of measurement methods and procedures to be applied	Electric power meter at each CHP measures the produced electric energy.
Frequency of monitoring/recording	Continuously
Value monitored	<table><tr><th>Year</th><th>Electrical energy produced [kWh/y]</th></tr><tr><td>2022</td><td>8,917,072</td></tr></table>
Monitoring equipment	Specifications of the power meters at the different CHP units: <table><tr><th>CHP</th><th>Type</th><th>Description</th><th>Unit</th><th>Accuracy class</th></tr><tr><td>CHP 1 - WKK 1</td><td>kWh1</td><td>Gross production meter WKK1</td><td>kWh</td><td>Class 1</td></tr><tr><td>CHP 2 - WKK 2</td><td>kWh3</td><td>Gross production meter WKK2</td><td>kWh</td><td>Class 1</td></tr><tr><td>CHP 3 - WKK 3</td><td>kWh4</td><td>Gross production meter WKK3</td><td>kWh</td><td>Class 1</td></tr><tr><td>CHP 4 - WKK 4</td><td>kWh5</td><td>Gross production meter WKK4</td><td>kWh</td><td>Class 1</td></tr></table>
QA/QC procedures to be applied	Precision is very high (uncertainty < 0,5%). The electric meters are sealed and maintained by the grid operator. Calibration is done by authorized service providers.
Purpose of the data	To cross-check the biogas produced and destroyed by the CHP engines
Calculation method	N/A
Comments	-

Data / Parameter	BGP
Data unit	Nm^3
Description	Biogas produced

Source of data	Calculated
Description of measurement methods and procedures to be applied	Calculated by the amount of biogas produced per ton of substrate input and recorded in the measurement reports (see Appendix B “App B - 1 - Meetrapport 2022 - Houbensteyn Milieu”)
Frequency of monitoring/recording	Monthly or annually
Value monitored	<table><tr><th>Year</th><th>Biogas produced [m³]</th></tr><tr><td>2022</td><td>4,193,505</td></tr></table>
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	To cross-check the methane produced and destroyed by the CHP engines
Calculation method	∑ (substrate input [t/a] x biogas production of substrate input [m³/t]) = total biogas production [m³/a]
Comments	

Data / Parameter	MC
Data unit	Vol-%
Description	Methane content of the biogas
Source of data	Calculated
Description of measurement methods and procedures to be applied	Calculated by the amount of electricity produced (EEP), the biogas produced (BGP) and the efficiency of the CHP engines ($ETA_{CHP\text{-}el}$).
Frequency of monitoring/recording	Annually
Value monitored	<table><tr><th>Year</th><th>Methane content [%]</th></tr><tr><td>2022</td><td>56,5</td></tr></table>
Monitoring equipment	N/A

QA/QC procedures to be applied	N/A
Purpose of the data	To cross-check the methane produced and destroyed by the CHP engines
Calculation method	The equation used to calculate the methane content is based on the validated formula in the PDD for calculating the biogas production (where MC = x_{CH4}): $$BGP = \frac{EEP}{(ETA_{CHP-el}) * HV_{Biogas}}$$ Where: BGP — Biogas produced [m³] EEP — Electrical energy produced [MWh] ETA_{CHP-el} — Electric efficiency of the CHP engines HV_{Biogas} — Calorific value of biogas [kWh/m³] With $$HV_{Biogas} = 0,01 \frac{MWh}{m^3} \cdot x_{CH4}$$ Where: 0,01 — Stoichiometric combustion calculation of CH_4 [MWh/m³]: 802,6 kJ/mol /0,02241 m³/mol = 35.814,37 kJ/m³ = 0,01 MWh/m³ x_{CH4} — CH_4 volume content of biogas flow [%]
Comments	-

	$B_{Biomass,y}$
Data unit	t
Description	Net quantity of co-ferments i fed into the digester
Source of data	Scale recordings
Description of measurement methods and procedures to be applied	Each co-ferment is weighed at delivery. The mass of the co-ferment is noted on the delivery receipt and electronically logged in the computer-based program Optimad from the Bright Company. The records are also logged in the RVO system.

<table>
<tr><td>Frequency of monitoring/recording</td><td>At delivery</td></tr>
<tr><td>Value monitored</td><td><table><tr><th>Year</th><th>Co-substrate input [t/y]</th></tr><tr><td>2022</td><td>14,199</td></tr></table></td></tr>
<tr><td>Monitoring equipment</td><td>Specifications of the weighing scale on the installation:
KEURINGS / CONTROLE RAPPORT
Serienummer(s): 3550
Type: sca1c1
Fabrikaat BWT Klasse: III
Ordernummer 10910 Tnr. : T2992 cem-cy 01/0025-5.2
Max: 70000 kg min: 400 kg e= 20 kg d= 20 kg
The date of the last calibration report before this monitoring period is from 06.10.2020</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Weighing scales are precise and belong to the accuracy class III. Calibration occurs when the devices need service or repair.</td></tr>
<tr><td>Purpose of the data</td><td>To cross check the biogas produced and destroyed by the engines</td></tr>
<tr><td>Calculation method</td><td>N/A</td></tr>
<tr><td>Comments</td><td>-</td></tr>
</table>

4.3 Monitoring Plan

The person responsible for collecting all data relevant for monitoring GHG emission reductions is Martin Houben, managing director of Houbensteyn Milieu BV. He has taken over the responsibility for monitoring and recording all data. The operation and maintenance of the biogas plant is carried out by the operating staff of the company. Generally, all the relevant data needed for the calculation and monitoring of emission reductions are also requested by the government for usual business operation and must be collected and recorded. Data is needed for controlling and accountancy, but also to meet the requirements for the feed-in tariff for energy production. The operating staff keep operation manuals which contain the input and output quantities of substrates, the power and heat generation of the plant as well as the runtime hours of the CHPs. These data are also logged electronically.

Substrate inputs and outputs

As for the last crediting period, the total amount of manure delivered to the biogas plant is determined through a calculative method, as the difference between the digestate sold, which is measured and recorded for the monitoring year 2022 (see Appendix B “2022 uitgaande mest hys”) and the co-ferments inputs (see Appendix B “App B - 1 - Meetrapport 2022 - Houbensteyn Milieu”). This method is considered to be very conservative, as it does not take into account the

weight loss due to dissolved biogas. The digestate leaving the biogas plant is weighed and the weighed amounts are logged in the official software of the government Dutch National Service for Enterprise (Rijksdienst voor Ondernement RVO), that records all the nutrients shifts and flows between farms under mijn.rvo.nl.

Manure delivered by external farms is transported by trucks to the biogas site and measured on site by means of a truck weighing scale (see Appendix B "App B - 4 - Technical specifications weighing scale"). Each manure delivery is recorded via a delivery receipt in the company's folder and logged digitally in the software of RVO (see Appendix B "App B - 5 - 2022 AANGEVOERDE MEST HYS"), as for the digestate. In these excel files, manure coming from the farm "Houbensteyn Heideveld BV" is excluded, since this farm is belonging to the Houbensteyn group.

Manure delivered by the Houbensteyn farms is calculated as the difference between the total amount of manure delivered minus the amount of manure delivered by external farms (see the calculation steps in Appendix B "App B - 3 - 2022 UITGAANDE MEST HYS").

The co-ferment substrates entering the biogas plant are weighed at delivery by a weighing scale. The delivery notes of each substrate delivered are stored as hard copies in folders on the plant's site. The amounts of co-substrates are electronically logged in the computer-based program Optimad from the Bright Company. The data is recorded in the monthly and annual measurement reports (see Appendix B "App B - 1 - Meetrapport 2022 - Houbensteyn Milieu).

Dry matter (dm) and Organic dry matter (odm) from manure

Pig manure samples from Houbensteyn farms, Aben farms (VCS Project ID 335) and Princepeel farms (VCS Project ID 337) were sent to laboratories to measure the respective dry matter and organic dry matter contents. The sample analyzes were carried out by accredited companies (Normec Robalab[7] and Eurofins[8]). Each of the 3 companies has taken 9 samples on the different livestock locations at different periods of time, in order to obtain representative results. The measurement results with confidence and precision levels of 90/10 are presented in Appendix B "App B - 6 - Measurements_dm-odm". The results show that over 95% of the dm/odm values are situated within the defined range.

For manure delivered by the Houbensteyn farms, average dm and odm contents are calculated based on the representative measurements mentioned above.

According to section 4.1 of the PDD, 90% of the average measured dm and odm contents from the 3 above mentioned projects are taken for manure deliveries from external farms (see Appendix A under "BE Manure – AMS-III D"). This approach is found to be conservative, since

[7] https://normecfoodcare.com/nl-en/accreditations-and-recognitions/

[8] https://www.eurofinsfoodtesting.com/accreditations-certifications

none of the results from dm/odm measurements are below the lower limit applies (90% of the mean value).

Heat production

The heat produced by the biogas plant has been used since 2006 for the company's own process (fermenter 1-3) as well as for heating the pig stalls and office buildings, preheating piglet food and for digestate hygienization.

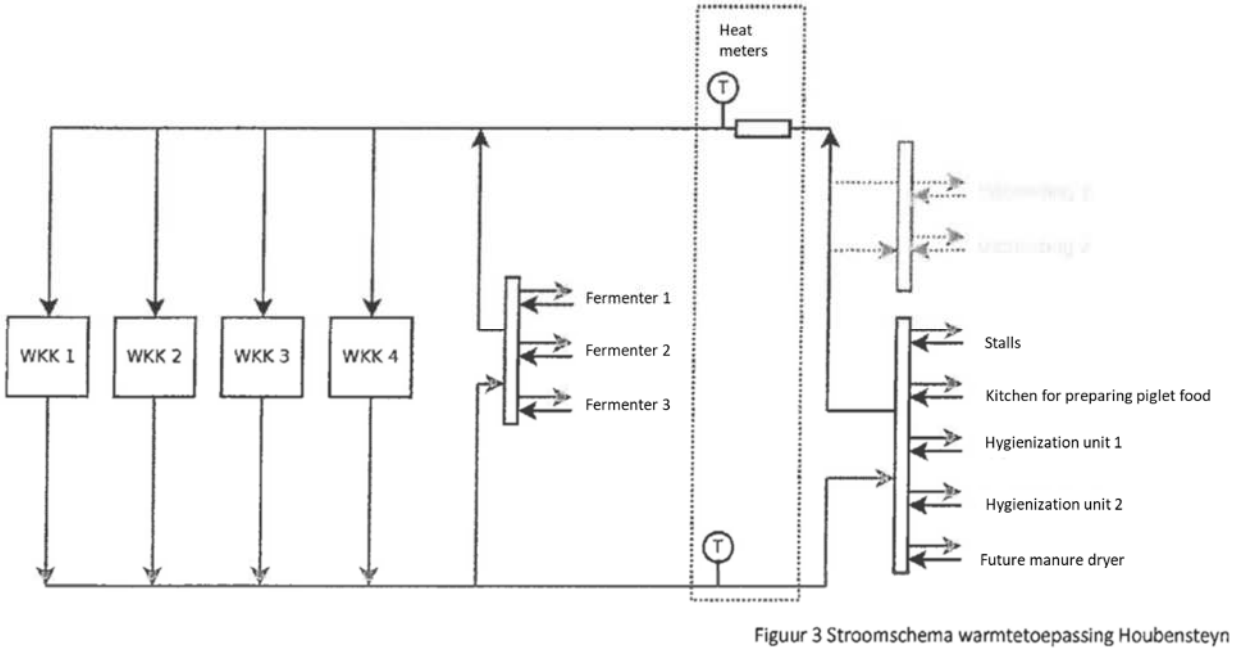


Figure 3: Translated schematic representation of heat flow, including heat meters and users (Source: Appendix B "Meetprotocol Houbensteyn Milieu BV", p. 6)

The thermal energy used externally has been officially measured by Fudura since June 2012 by means of heat meters and is recorded electronically in files named "Meetrapport 2022 - Houbensteyn" (see Appendix B). Calibration is regularly performed by an authorized service provider called Kamstrup. The official measurements are used to calculate heat consumption from space heating and for preheating piglet food (see Appendix A under "BE Heat – AMS-I C").

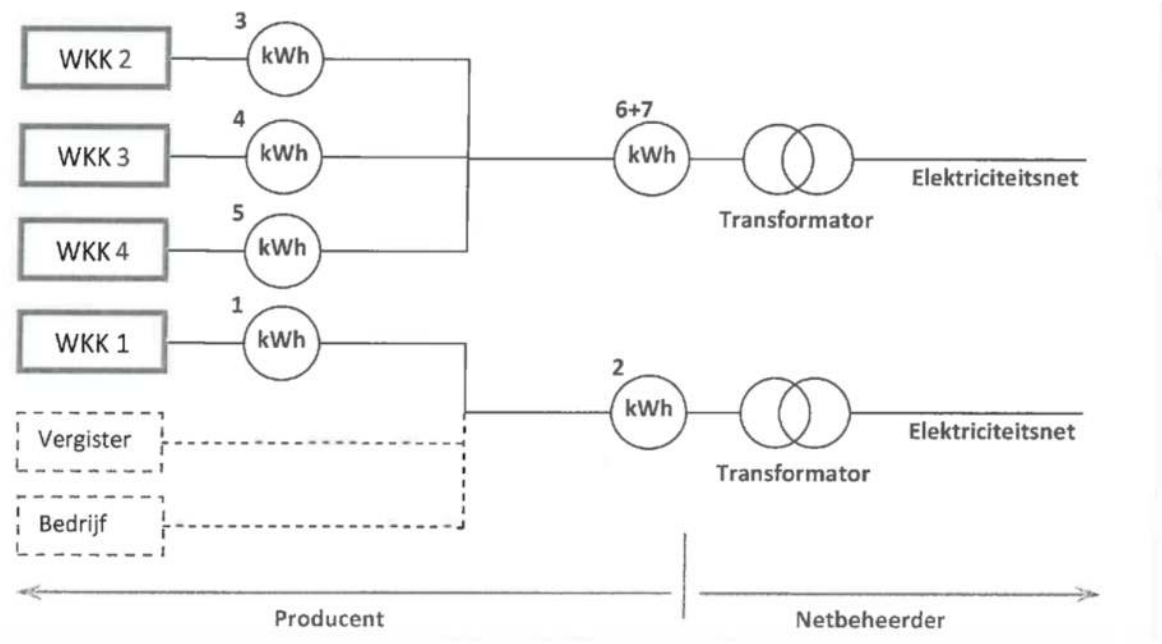
Electricity production

The electricity production is continuously recorded at the processing unit of the CHP (measurements every 15 minutes). The daily production is recorded by a data logger. The records of the daily electricity production rates measured by Fudura can be found since 2012 in the mandatory measurement reports provided by Eqwadraat (see Appendix B "Meetrapport 2022 -

Houbensteyn"). These reports are compiled and checked by Eqwadraat, as can be read on the last page of each of the reports. These mandatory measurement reports are sent to CertiQ (the Dutch issuing body for guarantees of origin and certificates of origin for heat and electricity generated from sustainable sources) for certification. CertiQ then send the certified documents to Rijksdienst voor Ondernement (RVO, government Dutch National Service for Enterprise), which is the decision-making authority regarding renewable energy subsidies".

The electric meters are supplied, installed, and operated by this recognized measuring company Fudura B.V. Fudura reads, collects and validates the necessary measurement data and send the data to the grid operator. Fudura also takes care of the control and maintenance of the meter. According to Fudura, the electricity measurements fully comply with the European CE-Directive Measuring Instrument Directive (MID). That means, that the meters are operated, maintained and calibrated according to the manufacturer's instructions. The installation and operation of the electrical meter is regulated by law. The operator has not the possibility access or manipulate the meters as they are sealed by officials (Fudura B.V.). This is a common fact in EU countries. Authorities require meters to be initially qualified (DU: "Eichung") which is similar to a calibration but can only be conducted by a competent authority. Accuracy is provided and safeguarded by law through the competent authority .

The accuracy class of the CHPs' power meters is given in a report named "Meetprotocol Houbensteyn Milieu B.V.", p. 8 ("Nauwkeurigheid = accuracy class", see Appendix B). This report contents also the data regarding electricity (and heat) production, their technical description and the monitoring methods. This report has to be submitted to the government and serves as basis for the subsidies.



Figuur 2. Schematische weergaven elektriciteitsstromen inclusief systeemgrens en meters

Figure 4: Schematic representations of electricity flow, including system boundary and meters (Source: Appendix B - "Meetprotocol Houbensteyn Milieu BV", p. 5.)

Methane content

The methane content has been continuously measured, but the data has not been regularly recorded. Only an estimation of the average annual methane content is possible. Therefore, as explained under section 3.2.1. of this monitoring report, the calculation method presented in the PDD used for calculating the biogas production is applied instead of using literature values of methane content from all substrates treated in the plants. The calculation bases on the biogas production, the electricity production, and the efficiency of the CHPs.

The biogas production is calculated by Eqwadraat and recorded in the measurement reports (see Appendix B "Meetrapport 2022 – Houbensteyn"). The electricity production is measured by Fudura and is also recorded in the measurement reports. The efficiency of the CHPs is given in the technical specification sheets of the CHPs (see Appendix B "Data sheet MAN LE [no]").

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

1. Baseline Emissions from Manure Management

The methane emission reduction through the project activity is calculated according to the small-scale Methodology AMS-III.D, as per section 4.1 of the registered PDD with following equation:

$$BE_{y,ex-post} = GWP_{CH_4} \cdot D_{CH_4} \cdot Uf_b \cdot \sum_{j,LT} MCF_j \cdot B_{0,LT} \cdot Q_{manure,j,LT,y} \cdot SVS_{j,LT,y}$$

Where:

$BE_{y,ex\ post}$	Baseline emissions in year y using ex-post monitored values (t CO_2e)
GWP_{CH4}	Global Warming Potential of CH_4 applicable to the crediting period (t CO_2e/t CH_4)
D_{CH4}	CH_4 Density (0.00067 t/m³ at room temperature (20 °C) and 1 atm pressure)
UF_b	Correction factor to account for model uncertainties (0.94)
j	Index for animal manure management system
LT	Index for all types of livestock
MCF_j	Annual methane conversion factor (MCF) for the baseline animal manure management system j
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type LT (m³ CH_4 / kg dm)
$Q_{manure,j,LT,y}$	Quantity of manure treated from livestock type LT and animal manure management system j (t/y, dry basis)
$SVS_{j,LT,y}$	Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y (t/t, dry basis)

The data and parameter used for ex-post baseline emission calculation are presented below.

Global Warming Potential (GWP_{CH4})

According to the VCS Standard v4.1, section 3.14.4, all ex-ante estimates and ex-post calculations may be converted to CO_2e using either the GWP values from the IPCC Fourth Assessment Report (AR4) or those from AR5.

For the project activity, the GWP value for methane of 28 established in AR5 has been chosen.

Methane Conversion Factor (MCF_j)

The MCF represents the percentage of manure's maximum methane-producing capacity that is actually achieved during manure management, i.e. part of organic matter actually converted into methane. In the Netherlands, liquid animal manure is stored in pits underneath the slatted floors of animal housing facilities[9]. Against this practice background and as part of the preparation of the National Inventory Report (NIR), country specific MCF values were calculated for liquid manure since the manure management systems are different from the circumstances on which the IPCC default is based[10].

The MCF value for pig manure is 36%.

Maximum methane producing potential of volatile solid ($B_{0,LT}$)

The value of B_0 depends on the degradability of the organic components in the manure. As for the MCF value, a country specific B_0 value is taken for liquid manure and used for ex-post emission calculation from manure management[11].

The B_0 value for pig manure is 0,31.

Quantity of animal manure ($Q_{manure,j,LT,y}$) and average dry matter content (dm_{LT})

As described in the PDD under section 3.6, the measured amount of fresh manure has to be multiplied by the values for dry matter content of animal manure (dm_{LT}) in order to have the equivalent value of manure on a dry basis, as required in the methodology:

$$Q_{manure,j,LT,y} = Q_{fm,j,LT,y} \cdot dm_{j,LT}$$

Where:

$Q_{manure,j,LT,y}$	Quantity of manure treated from livestock type LT and animal manure management system j (t/y, dry basis)
$Q_{fm,j,LT,y}$	Measured quantity of fresh manure treated from livestock type LT and animal manure management system j (t/y, fresh basis)

[9] "Greenhouse gas emissions in the Netherlands 1990-2019, National Inventory Report 2021", Section 5.3.2, p. 174.

[10] "Methodology for estimating emissions from agriculture in the Netherlands, Calculation from CH4, NH3, N2O, NOx, NMVOC, PM2.5 and CO2 using the National Emission Model Agriculture (NEMA) – Update 2021", Section 4.2.3, p. 54.

[11] "Methodology for estimating emissions from agriculture in the Netherlands, Calculation from CH4, NH3, N2O, NOx, NMVOC, PM2.5 and CO2 using the National Emission Model Agriculture (NEMA) – Update 2021", Section 4.2.3, p. 54.

$dm_{j,LT}$ Average dry matter content from manure of livestock type LT and animal manure management system j (t dry matter/ t fresh matter)

The average dry matter content (dm) from manure has been measured by accredited laboratories specialized in that field. According to the PDD section 5.2, samples for analysing the dry matter content of pig manure have been taken on each farm from Houbensteyn Ysselsteyn BV. In order to have a representative sample size, the dry matter content from pig manure from farms located in the same region (Aben farms, VCS Project ID 335, and Princepeel farms, VCS Project ID 337), have been measured and an average dm value of 0,117 was calculated from all dm results (see Appendix B "dm odm measurements").

Since the project is a co-digestion project with many external manure suppliers and according to section 3.6 of the PDD, the value for dry matter content from pig manure coming from external farms is 0,105, which represents 90% of the measured average value mentioned above.

Specific volatile solids content ($SVS_{j,LT,y}$)

Specific volatile solids content (SVS) of animal manure is the organic dry matter in livestock manure consisting of biodegradable and nonbiodegradable fractions. Together with the $dm_{j,LT}$ described above, $SVS_{j,LT,y}$ has been measured by accredited laboratories in accordance with section 5.2 of the PDD. As for the calculation of the average dm value, SVS from pig manure has been measured on Houbensteyn farms, as well as on Aben und Princepeel farms, in order to obtain an average SVS value. As a result, the average SVS value for pig manure from project's farms is 0,773.

Since the project is a co-digestion project with many external manure suppliers and according to section 3.6 of the PDD, the value for specific volatile content from pig manure coming from external farms is 0,696, which represents 90% of the measured average value mentioned above.

As a result, and using the formula above, the ex-post baseline emissions from pig manure treated in the monitoring year 2022 were calculated as follows:

$BE_{pig,own,2022}$ = 28 x 0.00067 x 0.94 x 36% x 0.31 m^3 CH_4/kg-dm x 35,720t/y x 0.117 dm/fm x 0.773 svs/dm

= 6,329 t CO_2e/a

$BE_{pig,ext,2022}$ = 28 x 0.00067 x 0.94 x 36% x 0.31 m^3 CH_4/kg-dm x 55,471 t/y x (0.105 dm/fm x 90%) x (0.696 svs/dm x 90%)

= 7,962 t CO_2e/a

$BE_{ex\ post,2022}$ = 6,329 + 7,962

= 14,291 t CO_2e/a

2. Baseline Emissions from external heat use

As explained in the PDD under section 3,6, the waste thermal energy produced by the biogas plant used by 3 external heat consumers (space heating, pre-heating piglet food and hygienization unit) is measured with only 1 heat meter, so that a calculative approach has been adopted to determine the heat use for the space and piglet food as well as for the hygienization unit.

The total baseline emissions from external heat use are:

$$BE_{thermal,CO_2,y} = BE_{thermal,CO_2,SH,PF,y} + BE_{thermal,CO_2,HYG,y}$$

Where:

$BE_{thermal,CO2,SH,PF,y}$ baseline emissions from space heating and preheating piglet food during the year y (Tj)

$BE_{thermal,CO2,HYG,y}$ baseline emissions from substrate hygienization during the year y (Tj)

a) Heating pig stalls and pre-heating piglet food ($BE_{thermal,CO2,SH,PF,y}$)

As described in section 4.1 of the PDD, the calculative approach to determine the thermal energy required for space heating (SH) and pre-heating piglet food (PF) used is:

$$BE_{thermal,CO_2,SH,PF,y} = \left(EG_{thermal,CO_2,SH,PF,y}/\eta_{BL,thermal}\right) \cdot EF_{FF,CO_2}$$

where:

$$EG_{thermal,CO2,SH,PF,y} = Heat_{tot,y} - Heat_{HYG,y}$$

with:

$EG_{thermal,CO2,SH,PF,y}$ the net quantity of heat supplied by the project activity for space heating (SH) and for pre-heating piglet food (PF) during the year y (TJ)

$Heat_{tot,y}$	total quantity of external heat use by the project activity during the year y (Gj), measured
$Heat_{HYG,y}$	net quantity of heat supplied by the project activity to the hygienisation unit (HYG) during the year y (Tj), calculated

And with:

$$Heat_{HYG,y} = Digestate \cdot Cap_{heat,PR} \cdot (T_{HYG,PR} - T_{inlet,PR}) \cdot 1/Eff_{ex,PR}$$

Where:

Digestate	quantity of digestate produced by the biogas plant in the year y (kg)
$Cap_{heat,PR}$	heat capacity of the digestate to be heated, set to the capacity of water 1,16 kWh/t
$T_{Hyg,PR}$	needed hygienization temperature, set to 75 °C
$T_{Inlet,PR}$	digestate inlet temperature to the hygienization system in the project scenario, set to the 37 °C
Eff_{Hex}	heat exchanger efficiency, set to 87 %

As a result, the ex-post baseline emissions from space heating and pre-heating piglet food in the monitoring year 2022 are represented as follows:

$Heat_{HYG,2022}$ = 105,390,330 kg x 1.16 kWh/t x (75°C – 37°C) x 1 / 87%

= 5,339,777 kWh

$EG_{thermal,CO2,SH,PF,2022}$ = 38,126 Gj / 1,000 Gj/Tj – (5,339,777 kWh x 0.0000036 kWh/Tj)

= 38 Tj – 19 Tj

= 19 Tj

$BE_{thermal,CO2,SH,PF,2022}$ = (19 Tj / 100%) x 56.40 t CO_2/Tj

= 1,066 t CO_2e

The different steps to calculate the ex-post baseline emissions from space heating and pre-heating piglet food are also detailed in Appendix A under "BE Heat - AMS-I C".

b) Heat use for hygienization unit ($BE_{thermal,CO2,HYG,y}$)

Since the amount of heat required in the project activity does not correspond to that used in the baseline scenario, direct measurements of $EG_{thermal,CO2,HYG,y}$ cannot be used for the calculation.

As for the first crediting period, a calculative approach is used:

$$BE_{thermal,CO_2,HYG,y} = (EG_{thermal,CO_2,HYG,y} / \eta_{BL,thermal}) \cdot EF_{FF,CO_2}$$

Where

$$EG_{thermal,CO_2,HYG,y} = Q_{fm,i,LT,y} \cdot Cap_{heat,BE} \cdot (T_{HYG} - T_{inlet,BE}) \cdot 1/Eff_{ex}$$

with

$EG_{thermal,CO2,HYG,y}$	Net quantity of thermal energy supplied by the project activity during the year y (TJ)
$Q_{fm,j,LT,y}$	annual manure excreted from the animals in kg during the year y
$Cap_{Heat,BE}$	heat capacity of the manure to be pre-heated, set to the capacity of water 4,18 kJ/kg K
T_{Hyg}	needed hygienization temperature, set to 70 °C
$T_{Inlet,BE}$	manure inlet temperature to the hygienization system in the baseline scenario, set to the average ambient temperature 10.8 °C
Eff_{ex}	heat exchanger efficiency, set to 100 %

Applying the above equations, the ex-post baseline emissions from hygienization in the monitoring year 2022 are presented as follows:

$EG_{thermal,CO2,HYG,2022}$	= 91,191,000 kg * 4.18 KJ/kg K * (70°C – 10.8°C) * 1 /100%
	= 23 TJ
$BE_{thermal,CO2,HYG,2022}$	= (23 TJ / 100%) * 56.40 t CO_2/TJ
	= 1,273 t CO_2

Therefore, emission reductions from fossil fuel displacement due to the project Methane Recovery Project Houbensteyn Ysselsteyn during the monitoring period 2022 are:

$BE_{thermal,CO2,tot,2022}$ = 1,066 t CO_2 + 1,273 t CO_2

= 2,339 t CO_2

5.2 Project Emissions

Project emissions – Manure management

According to the PDD and the methodology deviatons described in 3.2.1, emissions due to physical leakage of biogas have to be considered.

$PE_{PL,y}$ - Emissions from physical leakage of biogas

Project emissions from physical leakage are based on the total baseline emissions from manure management (BE_y) and are calculated as follows:

$$PE_{PL,y} = 0.10 \cdot BE_{y,ex-post}$$

The application of the formula above results in project emissions from physical leakage from the project activity Methane Recovery Project Houbensteyn Ysselsteyn during the monitoring year 2022 to the amount of 1,491 t CO_2e:

PE_{PL2022} = 0.10 x 14,291 t CO_2e

= 1,429 t CO_2e

5.3 Leakage Emissions

According to the PDD section 4.3., there is no leakage due to the project activity.

5.4 GHG Emission Reductions and Carbon Dioxide Removals

GHG emission reductions achieved in 2022 due to project activities are calculated based on 2 methodologies (AMS.III-D and AMS.I-C) in order to account for emissions avoidance from manure management and from the substitution of fossil fuels.

According to the AMS.III-D, the emissions reductions achieved from manure management in 2022 are the lowest value of the following:

$$ER_{y,ex\ post} = min[(BE_{y,ex\ post} - PE_{y,ex\ post}), (MD_y - PE_{power,y,ex\ post})]$$

Where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project from manure management based on monitored values for year y (t CO2e)
$BE_{y,ex\ post}$	Baseline emissions from manure management (t CO2e)
$PE_{y,ex\ post}$	Project emissions (t CO2e)
MD_y	Methane captured and destroyed or used gainfully by the project activity in year y (t CO2e)
$PE_{power,y,ex\ post}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in year y (t CO2e)

Since the project activity utilize the recovered methane for power generation, MDy is calculated as follows:

$$MD_y = \frac{EG_y \times 3600}{NCV_{CH4} \times EE_y} \times D_{CH4} \times GWP_{CH4}$$

Where:

$EG_{,y}$	Total electricity generated from the recovered biogas from manure in year y (MWh)
3600	Conversion factor (1 MWh = 3600 MJ)
NCV_{CH4}	NCV of methane (MJ/Nm³) (default value: 35.9 MJ/Nm³)
EE_y	Energy conversion efficiency of the project equipment, which is determined by adopting the default efficiency of 40%

The application of the formula above results in the following emissions reductions from methane gainfully used for power generation:

MDy = ((35,720 kWh + 55,471 kWh) x 3600 Mj/MWh) / (35.9 MJ/Nm^3 x 40%) x 0.00067 t/Nm^3 x 28

= 18,435 t CO_2e

Since the emissions from the use of fossil fuel or electricity for the operation of the installed facilities ($PE_{power,y,ex\ post}$) are 0 (please refer to Section 4.2 in the PD), the emission reductions from manure management achieved in 2022 are the lowest value of:

$ER_{y,ex\ post}$ = min [(14,291 – 1429), (18,435 – 0)]

= min [(12,862) , (18,435)]

Therefore, according to AMS-III.D section 4.6, the emission reductions from manure management achieved by the project activity results in 12,862 t CO_2e.

The total net GHG emissions reductions from all project activities are presented in the table below:

Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Reduction VCUs (tCO_2e)	Removal VCUs (tCO_2e)	Total VCUs (tCO_2e)
01-Jan-2022 to 31-Dez-2022	16,630	1,429	0	15,201	0	15,201
Total	16,630	1,429	0	15,201	0	15,201

Vintage period	Ex-ante estimated reductions/ removals	Achieved reductions/ removals	Percent difference	Explanation for the difference
01-Jan-2022 to 31-Dec-2022	12,708	15,201	+16	In the monitoring period 2022 40% more manure was treated in the biogas plant compared to the ex-ante estimated amount.
Total	12,708	15,201	-	

As already described in the PD under section 5.2 for parameter $Q_{fm,j,LT,y}$ (quantity of fresh manure treated), “Manure amounts can vary from year to year, depending on the manure availability in

the region". This is due to the fact, that there are no long-term contracts for manure deliveries. As a result, the project proponent must adjust to regional changes on a short-term basis, as can be seen in the table below:

Parameter	Manure inputs 2016*		Manure inputs 2017		Manure inputs 2018		Manure inputs 2019		Manure inputs 2020		Manure inputs 2021		Manure inputs 2022		Unit
	Houbens teyn	External suppliers	Houbens teyn	External suppliers	Houbens teyn	External suppliers	Houbens teyn	External suppliers	Houbens teyn	External suppliers	Houbens teyn	External suppliers	Houbens teyn	External supplier	
Qfm,j,LT,y															
Fresh manure	13.316	18.321	29.834	17.538	25.068	8.518	60.741	15.078	51.313	12.795	38.324	18.948	35.720	55.471	t/y
TOTAL manure	31.637		47.372		33.585		75.819		64.107		57.271		91.191		t/y

This directly impacts the annual amount of emission reductions, proportionally to changes in manure inputs:

Description	Baseline emission from manure management	Manure inputs
Unit	t CO2e	t/a
2016	4.989	31.637
2017	7.804	47.372
2018	5.664	33.585
2019	12.927	75.819
2020	10.929	64.107
2021	9.510	57.271
2022	14.291	91.191
Total	**66.115**	**400.984**

The increase in emission reductions is evidently attributed to a higher volume of manure being processed in the plant, yet the project's capacity has remained unchanged compared to the previous year.

The rise in emission reductions is attributed to a higher volume of manure being processed in the plant and is clearly not related to any expansion in the project's capacity. These changes in manure inputs have already been addressed in the PD and are typical for this type of project setup. Additional carbon credit revenues are essential to enable the further treatment of manure, ultimately resulting in further emission reductions. However, the project is still a small-scale project, the baseline and additionality are not affected by this increase.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

n.a. cf. 1.13

APPENDIX A: SPREADSHEET WITH CALCULATIONS

APPENDIX B: MONITORING PLAN DOCUMENTATION

1. Records of the electricity and heat production rates for the year 2022 certified by Fudura BV named “Meetrapport 2022 – Houbensteyn Milieu”
2. Electric efficiency of the CHPs under “Data sheet MAN LE 312” and “Data sheet MAN LE 202”
3. Annual quantities of digestate produced and recorded under “App B - 3 - 2022 UITGAANDE MEST HYS”
4. Technical specifications of the weighing scale named “App B - 4 - Technical specifications weighing scale”
5. Manure provided by external suppliers recorded under “App B - 5 - 2022 AANGEVOERDE MEST HYS”
6. Analyse of manure measurements’ results for dry matter and organic dry matter content recorded under “App B - 6 - Measurements_dm-odm”
7. Report containing information about electricity (and heat) production, their technical description, the monitoring methods as well as calibration reports named “App B - 7 - Meetprotocol Houbensteyn Milieu”