VALIDATION REPORT

"Methane fired power generation plant in Samrong Thom Animal Husbandry, Cambodia"

REPORT NO. 2007-1098

REVISION NO. 01

VALIDATION REPORT

DET NORSKE VERITAS
CERTIFICATION AS

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Date of first issue: 20 October 2007	Project No.: 92071098
Approved by: Miguel Rescalvo	Organisational unit: Climate Change Services
Client: Mitsubishi UFJ Securities Co., Ltd.	Client ref.: Mr. Matthew Setterfield

Project Name: Methane fired power generation plant in Samrong Thom Animal Husbandry
Country: Cambodia
Methodology: AMS-III.D and AMS-I.A
Version: Version 13 (AMS-III.D) and Version 12 (AMS-I.A)
GHG reducing Measure/Technology: Methane Recovery in Wastewater Treatment for the Generation of Renewable Electricity.
ER estimate: 6 262 tCO_2e per year over its seven year renewable crediting period.
Size
☐ Large Scale
☒ Small Scale
Validation Phases:
☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues
Validation Status
☐ Corrective Actions Requested
☐ Clarifications Requested
☒ Full Approval and submission for registration
☐ Rejected

In summary, it is DNV's opinion that the "Methane fired power generation plant in Samrong Thom Animal Husbandry, Cambodia" project, as described in the PDD version 03 of 16 September 2008, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodologies AMS-III.D (version 13) and AMS-I.A (version 12). DNV thus requests the registration of the project as a CDM project activity.

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Report title:
Methane fired power generation plant in Samrong Thom Animal Husbandry in Cambodia

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Key words:
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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
DNV	Det Norske Veritas
DNA	Designated National Authority
EC-ASEAN	European Commission- Association of Southeast Asian Nations
EF	Emission Factor
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IGES	Institute for Global Environmental Strategies
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
NCV	Net Calorific Value
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
REE	Rural Electricity Enterprise
STAH	Samrong Thom Animal Husbandry
UNFCCC	United Nations Framework Convention on Climate Change

VALIDATION REPORT

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1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the "Methane fired power generation plant in Samrong Thom Animal Husbandry, Cambodia" project. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host Party criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The project participants are Samrong Thom Animal Husbandry from the host Party Cambodia and the Clean Energy Finance Committee, Mitsubishi UFJ Securities Co., Ltd. from the Annex I Party, Japan. The Parties involved meet the requirements to participate in the CDM and have approved the project and authorized the project participants. The DNA from Cambodia has confirmed that the project assists in achieving sustainable development.

Having a total installed capacity of less than 15 MW_{el}, and emission reductions below 60 kt CO_2e per year, the project is eligible as type I and type III small-scale CDM project activity.

The project applies the simplified baseline and monitoring methodologies AMS-III.D "Methane recovery in agricultural and agro industrial activities" (Version 13) and AMS-I.A "Electricity generation by the user", (Version 12).

By capturing and utilizing methane that would otherwise have been emitted to the atmosphere and by generating renewable energy from biogas which will replace electricity from diesel generators, the project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project faces technological barriers and barriers due to prevailing practices and is thus not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

Following a request for review, the total emission reductions from the project has been updated and estimated to be on the average 5 593 tCO_2e per year over its seven year renewable crediting period. The emission reduction forecast has been checked and it is deemed likely that the estimated amount is achieved given that the underlying assumptions do not change.

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The monitoring plan is in line with the approved monitoring methodologies AMS-III.D and AMS-I.A. The plan adequately addresses all necessary information for monitoring and reporting of emission reductions due to the project activity. Responsibilities and authorities for project management, monitoring and reporting and QA/QC procedures have been described in the PDD. These procedures should be implemented at the latest prior to the start of the crediting period.

There is no requirement for an EIA by the host Party for this project. The project is not likely to create any significant adverse environmental effect. The project complies with all statutory requirements and environmental legislation of Cambodia.

In summary, it is DNV's opinion that the "Methane fired power generation plant in Samrong Thom Animal Husbandry, Cambodia" project, as described in the project design document of 6 November 2007, meets all relevant UNFCCC requirements for the CDM, is eligible as

category I and III small-scale CDM project activity and correctly applies the approved simplified baseline and monitoring methodologies AMS-III.D (version 13) and AMS-I.A (version 12). Hence, DNV requests the registration of the "Methane fired power generation plant in Samrong Thom Animal Husbandry, Cambodia" project as a CDM project activity.

2 INTRODUCTION

Mitsubishi UFJ Securities Co., Ltd. has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the "Methane fired power generation plant in Samrong Thom Animal Husbandry, Cambodia" project in Cambodia. This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the simplified modalities and procedures for CDM small-scale project activities and the subsequent decisions by the CDM Executive Board.

2.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, the simplified modalities and procedures for small-scale CDM project activities and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodologies AMS-III.D (Version 13) and AMS-I.A (Version 12). The validation team has, based on the recommendations in the Validation and Verification Manual / 4/ employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

3 METHODOLOGY

The validation consisted of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk Review of the Project Design Documentation

The following table outlines the documentation reviewed during the validation:

/ 1/ Mitsubishi UFJ Securities Co., Ltd.: *"Methane fired power generation plant in Samrong Thom Animal Husbandry, Cambodia"* version 01 dated 9 August 2007, final version 03 dated 16 September 2008.

/ 2/ Climate Change Office, Department of Planning and Legal Affairs, Ministry of Environment (DNA of Cambodia): Letter of Approval received on 15 October 2007

/ 3/ The Liaison Committee for the Utilization of the Kyoto Mechanisms Ministry of Foreign Affairs, Climate Change Division, International Cooperation Bureau. (DNA of Japan): Letter of Approval received on 15 October 2007

/ 4/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. http://www.ieta.org/ieta/www/pages/index.php?IdSitePage=200

/ 5/ CDM Executive Board: *"Methane recovery in agricultural and agro industrial activities"*, AMS-III.D, version 13 of EB 33.

/ 6/ CDM Executive Board: *"Electricity generation by user"* AMS-I.A, version 12 of EB 33.

/ 7/ Appendix B of the simplified modalities and procedures for small-scale CDM project activities: *Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*. Version 11 adopted at EB 35.

/ 8/ IPCC: *"2006 IPCC Guidelines for National GHG Inventories"*

/ 9/ EC-Asean Energy Facility: *"Feasibility Study of a Methane-fired Power Generation Plant in Kien Svay District, Kandal Province, Project Number 103-2004"* Publication Reference: EuropeAid/119920/C/SV, dated August 2006.

/ 10/ Documents reviewed during follow-up interviews:

- Stakeholder Consultation Minutes and Attendance List
- Spreadsheet of *"Five most recent biogas projects with issued CERs"*
- CERs computations
- Historical Swine population
- Lagoon dimensions
- Organisational chart of CDM monitoring workflow
- CDM Country Guide for Cambodia (DNA of Cambodia)
- Workshop on Opportunity from Livestock Manure Management for Energy

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Productions and the Clean Development Mechanism Project, hosted by Livestock Department (DAPH), dated 26 July 2005

- Training Seminar on Energy Efficiency and Biogas Utilization for CDM Project, hosted by Ministry of Environment dated 29 September 2005

The main changes between the version of the PDD published for the 30 days stakeholder commenting period and the final version submitted for registration are as follows:

- Coordinates of the project activity, 11°23'40.86"N latitude, and 105°13'52.76"E longitude have been included in the revised PDD;
- The revised PDD does not longer apply AMS-I.D (version 12) since the project may supply electricity to a mini-grid which is covered by AMS-I.A.
- The PDD has been revised to indicate that the farm biogas generator supply of electricity to a Rural Electricity Enterprise (REE) will be confirmed in phase 2 of the project;
- Starting date of the project activity revised to reflect the starting date of the construction, 15 April 2007;
- Amount of fossil fuel consumed will be monitored ex-post in the revised PDD.
- Emission factor for diesel generator system in STAH piggery farm has been revised from 1.3 $kgCO_2e/kWh$ to 0.8 $kgCO_2e/kWh$;
- Specifications of the existing diesel generators in the farm have been included in the revised PDD;
- Average historical swine population for the year of 2006 has been used in the calculation in the revised PDD;
- Archiving period of the monitoring data has been included in the revised PDD;
- Starting date of the crediting period has been revised to 4 June 2008, or the date of registration, whichever comes earlier.

3.2 Follow-up Interviews with Project Stakeholders

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	Date	Name	Organization	Topic
1.	2007-09-28	Mr. Tin Ponlok and Mr. Thy Sum	DNA of Cambodia	➢ Host country approval status. ➢ Legal and environmental requirements. ➢ Stakeholder consultation requirement. ➢ Common practice in Cambodia. ➢ Sustainable development issues.
2.	2007-09-27	Mr. Matthew	Mitsubishi UFJ	➢ Project technology.

Setterfield and Mr. Raymond Caguioa from Mitsubishi UFJ Mr. Pascal Khoy and Mr. Leng Sun Rafael from SamRong Thom Animal Husbandry	Securities Co., Ltd & Samrong Thom Animal Husbandry	➢ Project participants. ➢ Applicability criteria and bundling. ➢ Additionality. ➢ Legal and environmental issues. ➢ Stakeholder consultation process. ➢ Monitoring plan and project management. ➢ Emission reduction calculations.

3.3 Resolution of Outstanding Issues

The objective of this phase of the validation was to resolve any outstanding issues which needed be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in the figure below. The completed validation protocol for the "Methane fired power generation plant in Samrong Thom Animal Husbandry" project is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of CDM criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

i) mistakes have been made with a direct influence on project results;
ii) CDM and/or methodology specific requirements have not been met; or
iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

A request for clarification (CL) may be used where additional information is needed to fully clarify an issue. Following a request for review, upon the request of the EB, the PDD and validation report have been updated to exclude the CERs attributable with the export of power production and the inclusion of the monitoring of flare and combustion efficiency.

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Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities		
Requirement	***Reference***	***Conclusion***
The requirements the project must meet.	*Gives reference to the legislation or agreement where the requirement is found.*	*This is either acceptable based on evidence provided (**OK**), a **corrective action request (CAR)** of risk or non-compliance with stated requirements or a request for **clarification (CL)** where further clarifications are needed.*

Validation Protocol Table 2: Requirement checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
The various requirements in Table 2 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the large-scale PDD template, version 03 - in effect as of: 28 July 2006. Each section is then further sub-divided.	*Gives reference to documents where the answer to the checklist question or item is found.*	*Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.*	*The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.*	*This is either acceptable based on evidence provided (**OK**), or a **corrective action request (CAR)** due to non-compliance with the checklist question (See below). A request for clarification (CL) is used when the validation team has identified a need for further clarification.*

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests	***Ref. to checklist question in table 2***	***Summary of project owner response***	***Validation conclusion***
If the conclusions from the draft Validation are either a CAR or a CL, these should be listed in this section.	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants during the communications with the validation team should be summarised in this section.*	*This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

Figure 1 Validation protocol tables

3.4 Internal Quality Control

The draft validation report including the initial validation findings underwent a technical review before being submitted to the project participants. The final validation report underwent another technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation Team

Role/Qualification	Last Name	First Name	Country
Team leader, CDM validator	Lai	Chee Keong	Malaysia
GHG Auditor	Lai	Denise	Malaysia
GHG Auditor	Wong	Simon Yon-Sing	Malaysia
Sector expert	Ramachandran	Ramesh	India
Technical reviewer (applicant)	Viddal	Mari Grooss	Norway
Technical reviewer and Sector Expert	Lehmann	Michael	Norway

The qualification of each individual validation team member is detailed in Appendix B to this report.

4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The final validation findings relate to the revised project design document version 3 dated 16 September 2008, / 1/

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4.1 Participation Requirements

The project participants are Samrong Thom Animal Husbandry of Cambodia and the Clean Energy Finance Committee, Mitsubishi UFJ Securities Co., Ltd. of Japan. The host Party Cambodia and the Annex I Party Japan meet the requirements to participate in the CDM. The DNA of Japan has issued the Letter of Approval (LoA) on 15 October 2007, authorizing the Clean Energy Finance Committee, Mitsubishi UFJ Securities Co., Ltd. as project participant / 2/. The Letter of Approval from the DNA of Cambodia has been provided on 15 October 2007, authorizing Samrong Thom Animal Husbandry as project participant, and including an official confirmation that the project activity contributes to Cambodia's sustainable development/ 3/.

The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards Cambodia. It has been confirmed with the Cambodia DNA and the project participant that the project has not received any ODA.

4.2 Project Design

The project involves the implementation of an anaerobic reactor digestion system that will capture methane rich biogas generated from the wastewater of the Samrong Thom Animal Husbandry (STAH) piggery farm and its combustion for electricity generation at the piggery farm. It was reported during follow-up interviews that the farm normally employs scraping and hose-down cleaning of waste, where the wastewater is treated in a series of open anaerobic lagoons.

The anaerobic reactor digestion system will treat 100% of effluents produced from the swine rearing operations. The technology is provided from Thailand. The biogas generated by the digester is collected and combusted in a biogas-fuelled generator to generate electricity, which replaces electricity previously generated by diesel fuelled generators. Furthermore, in response to the questions raised during review for the project, it has been clarified that surplus biogas if any, will be combusted in an open flare. The technology utilized is deemed good current practice. The validation team was able to verify during the site visit that the existing diesel generators are combination of old and newer generators. Surplus electricity may also be sold to a nearby Rural Electricity Enterprise (REE) mini-grid at a later stage. No CERs attributable to the displacement of grid electricity by the project activity will be claimed.

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The subsequent effluents from the digester will be transferred to the second and third lagoon, both having depths of more than 4 meters. No effluent will be released to open water bodies.

It has been confirmed during follow-up interview that the project activity is not a debundled component of a larger project activity. The project activity has started operation on 1 September 2007. It was confirmed during follow-up interviews that the excavation works began on 15 April 2007, and this is reflected as the corresponding starting date of the project activity. The project selects a renewable crediting period of 7 years starting from 4 June 2008, or at the date of registration, whichever comes later. The project aims to reduce 5 593 tCO_2e per year over the crediting period.

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4.3 Baseline Determination

The project applies the simplified baseline methodologies type III.D (*methane recovery in agricultural and agro industrial activities*) version 13 in combination with type I.A. (*electricity generation by the user*) version 12 / 5/ & / 6/.

The project is within the eligibility requirements of the baseline methodology AMS III.D since:

i) It recovers methane generated from the treatment of swine manure by installing methane recovery and combustion systems and

ii) Emission reductions are below 60 kt CO_2e per annum as required in AMS III.D.

The project is within the eligibility requirements of the baseline methodology AMS I.A since:

i) The project's biogas fired generator (for own consumption and export to REE) has a total capacity of 200kW, which is less than the eligibility limit of 15 MW, and

ii) The project comprises renewable energy generation units that supply the farm and possibly the neighbouring mini-grid (Rural Electricity Enterprise, REE) with electricity.

It has been confirmed during follow-up interviews that the present piggery farm treatment facility, the open lagoon system, is able to treat the swine waste and no effluent is discharged to the environment. The current treatment facility is thereby able to meet the current environmental standards. Open lagoon system is the prevalent effluent disposal process in all the piggery farms in Cambodia.

In the absence of the proposed activity, high organic effluent from the farm will therefore likely continue to be anaerobically treated in open lagoon systems and the methane generated, as result of anaerobic degradation of biogenic material, will escape into the atmosphere. Thus the baseline scenario is deemed to be the continuation of the current scenario of lagoon based organic wastewater treatment and the generation of electricity from the diesel generators on site.

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The project's system boundary includes the anaerobic reactor digestion system, the biogas transferring equipment, the 200kW biogas-fuelled generator and the open flare system.

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4.4 Additionality

Evidence has been provided to proof that STAH has considered CDM before the implementation of the project activity. This was evidenced by a copy of the feasibility study which considers the potential benefits from CDM. A copy of the feasibility study conducted by EC-Asean Energy facility dated August 2006 has been provided for review / 9/.

Prior to that, the project owner has been aware of CDM via attending CDM workshops hosted by the Institute for Global Environmental Strategies (IGES) in 26 July 2005 and 29 September 2005 respectively / 10/. The project started excavation works on 15 April 2007. The validation of the project started in August 2007.

It has been verified during follow-up interviews that the present method of wastewater treatment by open lagoons meets all the regulatory requirements. There are no upcoming regulations that are likely to require the up-gradation of the system. Various technology and prevailing practice barriers to the implementation of the project activity demonstrate the project's additionality. The investment analysis is not applied.

Technological barrier:

It was confirmed during follow-up interview with the DNA of Cambodia that the project activity is the first of its kind in the country, and is likely to face shortage of skilled workers in handling day-to-day operations of the biogas system. The technology is imported from Thailand.

Methane extraction projects have shown mixed results in other projects. Being exposed to uncertainties such as insufficient gas for gas engines, shortage of skilled operators and design engineers for biogas plants were reported to be the barriers faced by the project.

During follow-up interviews, a spreadsheet was provided showing the five most recent biogas CDM projects in South America. The spreadsheet indicates that similar biogas capture projects from animal waste have not reached the potential emission reduction targets estimated *ex-ante* during validation stage / 10/.

Prevailing / common practice barriers:

It has been demonstrated that open lagoon treatment is the prevalent wastewater treatment method in Cambodia. Most of the large swine farms use the open lagoon system, while electricity in the farms is generated by diesel fired generators. It has been confirmed with the DNA of Cambodia that the open lagoon system is the common practice and it complies with the prevailing legal requirements.

It was explained during follow-up interviews that the additional income from CER sales and possibly power sales to REE would enable the project owner to take on a risky and first of its kind project. In the event of the project facing unexpected costs due to breakdown of equipment and calling of maintenance engineers from neighbouring countries, the additional revenue from the CDM will justify the repairing of such equipment, and continued operation of the project.

Based on the above, it is deemed likely that STAH would not have gone ahead with the project, and kept their focus on their key business of producing pigs without the CDM. It is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions are hence additional.

4.5 Monitoring

The monitoring plan is in accordance with the approved monitoring methodologies:

- AMS-III.D, "*Methane recovery in agricultural and agro industrial activities*", version 13 EB 33, / 5/
- AMS-I.A, "*Electricity generation by the user*", version 12 EB 33. / 6/

4.5.1 Parameters determined ex-ante

The below parameters are required to estimate the emission reductions *ex-ante* for the respective methodologies:

AMS-III.D:

(i) annual emission factor for swine' (EF_{swine}, 17.021kgCH_4/swine/year, calculated as per IPCC 2006),

(ii) daily volatile solid excreted for swine, (VS_{swine}, 0.3kgVS/swine/day),

(iii) fraction of swine manure handled using manure management systems (MS, local value of 1 (100%)),

(iv) methane conversion factor (MCF, 0.8 (80%), IPCC 2006 T 10A-8),

(v) maximum methane production capacity of the manure (Bo_{swine}, 0.29 m^3/kg VS, IPCC 2006 T 10A-8),

(vi) conversion factor of m^3CH_4 to kgCH_4, (0.67kg/m^3),

(vii) Specific fuel consumption, biogas, per unit of electricity generated (SCF_{biogas}, 0.28055 m^3/kWh, calculated as per IPCC 2006 and AMS I.A),

(viii) Net Calorific Value of biogas, (NCV_{biogas}, 50.4 GJ/t, IPCC 2006, Vol.2 Chp.1 Table 1.2), and

(ix) Efficiency of biogas engine, (Eff, 0.38 in fraction, supplier specification)

(x) Default value of 90% is selected for the electricity combustion efficiency

(xi) Default value of 50% is selected for the flare efficiency for open flare (%, $n_{flare,h}$)

The values for the default parameters were obtained from the 2006 IPCC Guidelines for National GHG Inventories. The monitoring of flare and combustion efficiency have been included in response to the questions raised during review for the project, it has been clarified that

References for each value used are shown in Section B.6.2 and B.6.3 of the PDD.

A one year swine population has been included in the revised PDD. The validation team was able to verify through historical swine population records that the highest population is in the month of October (i.e. 15 420) with the lowest in the month of February (i.e. 13 864), with an average of 14 774 per month. The latter was applied in the *ex-ante* emission reduction estimation / 10/.

AMS-I.A:

The emission factor for diesel generators systems is determined from Table I.D.1 of AMS.I.D. The default value of 0.8 kgCO_2e/kWh and 1.3 kgCO_2e/kWh were applied for the diesel generator system in the piggery farm and diesel powered battery chargers connected to the REE grid respectively. The local community is currently using wet cells (batteries). The batteries are recharged at battery-recharging shops and the shops are relying on diesel fired generators to charge the batteries. The characteristics of the battery charging stations in the

project vicinity were tabulated in the Feasibility study / 9/. The validation team was able to verify from the feasibility study report that the diesel generators connected to the REE grid have a total capacity of 15HP (about 11kW), thus the emission factor of 1.3 $kgCO_2e/kWh$, applicable for the range of 35-135kW is deemed conservative. Whether surplus electricity will be supplied to the REE will be confirmed in phase 2 of the project by December 2008. The project proponent does not have a concrete plan or provision to undergo the export of excess electricity. Hence, the decision of selling electricity to REE is not firm and it shall be verified during the first verification. Furthermore, in response to the questions raised during review for the project, it has been clarified that in the event where implementation of export electricity to the REE takes place, the amount of electricity generated by the project activity exported to the REE grid will be metered continuously using an electricity meter. No CERs attributable to the displacement of grid electricity by the project activity will be claimed.

4.5.2 Parameters monitored ex-post

The monitoring of the following GHG indicators will allow for an *ex-post* determination of emissions reductions:

- Fraction of methane in biogas ($F_{CH4\_captured}$, fraction),
- Temperature of biogas combusted (T_{biogas},K),
- Pressure of biogas combusted (P_{biogas}, bar),
- Swine population in STAH Farm ($P_{swine,y}$, number of swine)
- Amount of electricity generated by the project activity ($E_{gross,y}$,kWh/year),
- Amount of electricity sold to the REE ($E_{REE,y}$, kWh/year),
- Amount of electricity utilized by the farm ($E_{STAH,y}$,kWh/year),
- Amount of biogas recovered by the project activity ($BG_{burnt,y}$, m^3), and
- On-site inspection of Samrong Thom Animal Husbandry (STAH) piggery farm.
- Temperature of the flare (T_{flare}, ^oC)
- Biogas flared will be monitored through the use of a thermal mass flow meter if there is surplus biogas (m^3,$BG_{burnt,f,y}$), and
- Default value of 50% is selected for the flare efficiency for open flare (%, $n_{flare,h}$) and a default value of 90% is selected for the electricity combustion efficiency

Although the project activity is not anticipated to consume diesel, if under any circumstances consumption of diesel is required, the amount of diesel consumed will be monitored and this has been included in the ex-post monitoring in the revised PDD. The project activity chose an open flare system to combust excess biogas. As a requirement in AMS-III.D, at anytime the temperature of the flare is below 500^{o}C, 0% default value would be used in the period. The temperature of the flare will be monitored by a thermocouple and an electronic data logger to determine the duration for which the temperature reaches 500^{o}C occurs in the flare.

Sludge from the wastewater treatment system will be land applied. The dried sludge will be collected and used as soil fertilizer. By spreading a thin layer of sludge in the open field and left to dry under the sun, the methane emissions resulting from sludge will be minimal. The monitoring of sludge will enable subsequent verification of emission reductions.

In accordance with AMS-III.D, emissions will be assessed *ex-post* for each year during the crediting period and the lower of the below two values is selected:

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(a) Actual monitored amount of methane captured and destroyed by the project activity.
(b) The methane emissions calculated ex ante using the amount of the manure that would decay anaerobically in the absence of the project activity, with the most recent IPCC tier 2 approach.
The continuous metering of electricity generated from the project and monitoring of methane recovered and used as fuel, will give opportunity for real measurements of achieved emission reductions. Biogas is continuously monitored by the use of a gas flow meter.

The DNA of Cambodia does not require monitoring of sustainable development indicators.

4.5.3 Management system and quality assurance

Some of the procedures required for proper project management are listed as follows:

a) registration, monitoring, measurement and reporting,

b) addressing erroneous data measurements,

c) maintenance of monitoring equipment,

d) handling of day-to-day records,

e) review of reported results and data,

f) internal review of monitoring data and parameters, and

g) corrective actions in times of deviation.

These procedures will be established and implemented at the latest before the commencement of the project activity and need to be checked during the first periodic verification. All critical data are either measured or calculated and will be archived for the crediting period plus two years beyond as per the approved monitoring methodology.

4.6 Estimate of GHG Emissions

Project CO_2 emissions from use of fossil fuels or electricity for the operation of the facility needs to be considered under AMS.III.D. As the biogas generators in the project activity replaces the diesel generators, no project emissions are anticipated in the project activity. However, should the project activity result in the use of fossil fuel, calculation of project emissions will be taken into account when calculating the emission reductions ex-post. The proposed calculation is the product of two parameters: a) fossil fuel consumption and b) CO_2 emission factor of fossil fuel used.

The baseline emission boundaries cover the following:

i) Emissions from STAH diesel generators;

Baseline emissions from the existing diesel generators installed in the piggery farm are calculated to be 312 tCO_2e per year with the default emission factor of 0.8$kgCO_2e$/kWh as of AMS-I.D as stipulated by AMS-I.A.

ii) Emissions from the open lagoons;

The ex-ante calculated yearly methane generation potential in the baseline is 5 281 tCO_2e per year. The calculations are in accordance with the most recent IPCC tier 2 approach (2006 IPCC guidelines).

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As evidenced from the feasibility study report, the diesel generators in the REE grid have a total of 15HP capacities (about 11kW), thus the emission factor of 1.3$kgCO_2e$/kWh, applicable for the range of 35-135kW in accordance with AMS-I.D and as stipulated by AMS-.I.A, is deemed conservative. However, the decision of selling electricity to REE is not firm and it shall be verified during the first verification. Baseline emissions from the diesel generators connected to the REE are estimated to be 781 tCO_2e per year.¶

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The project activity does not result in any leakage as the project equipment is not transferred from another activity. Emission reductions were calculated by subtracting the project and leakage emissions from the baseline emissions. The expected emission reductions were calculated to be 5,593 tCO_2e per year over the project crediting period.

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4.7 Environmental Impacts

The project activity does not require an Environmental Impact Assessment under Cambodian law. According to the DNA of Cambodia, an EIA is required if the power plant has a total generating capacity of 5MW and above. Furthermore, since the project participant has reassured that no effluent will be discharged to main water bodies, no sampling of COD and BOD is needed. The project activity involves the installation of a generator; however the DNA confirms that no legal requirement is needed on the installation of the generator. Four environmental aspects of a wastewater treatment plant have been identified. These relate to noise, odour, emissions of gaseous pollutants, and safety. None of these are of significance in the context of the project. The project has no significant negative impact on the environment. The project has received the necessary environmental licenses from the relevant authorities in Cambodia.

4.8 Comments by Local Stakeholders

The local stakeholders of the project have been consulted through a public meeting. The public meeting was held in Samrong Thom Animal Husbandry on 29 April 2007. The project host has informed the village head to ensure relevant stakeholders will attend to the public meeting. The relevant stakeholders identified for the project are the Samrong Thom and neighboring communes, local school and village residents. These stakeholders have been consulted. The minutes of meeting including the concerns raised by the stakeholders and the responses from the Project Proponent has been provided to DNV / 10/. The project did not receive any adverse comments.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD of 9 August 2007 was made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 11 August 2007 to 9 September 2007. No comments were received.

APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	OK
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	~~CAR 1~~ OK
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	~~CAR 1~~ OK
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	~~CAR 1~~ OK
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	OK
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK

Requirement	Reference	Conclusion
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	OK
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedures §31b	OK
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	Table 2, Section B.3. OK
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK Table 2 Section B.7 and Section D.1.
About small-scale project activities (if applicable)		
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakech Accords and shall not be a debundled component of a larger project activity.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK Table 2, Section A.1.
13. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and use the simplified baseline and monitoring methodology for that project category.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK Table 2, The project conforms to the methodology Type AMS-I.A and AMS-III.D
14. If required by the host country, an analysis of the environmental	Simplified Modalities	Not applicable

Requirement	Reference	Conclusion
impacts of the project activity is carried out and documented.	and Procedures for Small Scale CDM Project Activities §22c	Table 2, Section D Any project of less than 5MW in Cambodia is not subjected to EIA regulation.
About stakeholder involvement		
15. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK Table 2, Section E
16. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK The PDD of the Methane fired power generation plant in Samrong Thom Animal Husbandry project was made available on www.dnv.com/certification/climatechange and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during the period from 11 August 2007 to 9 September 2007. No comments were received.
Other		
17. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
18. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
19. The baseline methodology shall exclude to earn CERs for decreases	CDM Modalities and	OK

Requirement	Reference	Conclusion
in activity levels outside the project activity or due to force majeure.	Procedures §47	
20. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B, EB Decision	OK The PDD is in conformance with the UNFCCC CDM PDD format.
21. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK

Table 2 Requirements Checklist

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/ 1/	DR I	The project is situated in Phum Prek Treng, Khum Samrong Thom, Kandal Province in Cambodia. A more specific location such as the coordinates of the project location is needed to ensure unique identification of the project. (This has been addressed in PDD Version 3 dated 16 September 2008)	~~CL 1~~	OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/ 1/	DR	The project's system boundary includes the anaerobic reactor digestion system, the biogas transferring equipment, a 200kW biogas-fuelled generator and the REE. It was reported during follow-up interviews that currently there are no agreement in place to sell or connect the excess electricity from the project activity to the grid. Hence it is unclear to how the project activity is going to claim CERs from the displacement of electricity from the REE.	~~CL 2~~	OK

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CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			(This has been addressed in PDD Version 3 dated 16 September 2008)		
A.2. Participation Requirements *Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.*					
A.2.1. Which Parties and project participants are participating in the project?	/ 1/	DR	Cambodia is the participating Non-Annex 1 Party, while Japan is the Annex-1 Party. Samrong Thom Animal Husbandry of Cambodia and Mitsubishi UFJ Securities Co., Ltd. of Japan are the project participants.		OK
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/ 1/ / 2/ / 3/	DR	The Letters of Approval (LoA) from the DNA of Cambodia and Japan are pending. Letters of Approvals from DNA of Cambodia and Japan were both obtained on 15 October 2007.	~~CAR 1~~	OK
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/ 1/	DR	**Cambodia (Non-Annex 1 Party)** - Ratified the Kyoto Protocol on 22 August 2002. - Climate Change Office, Department of Planning and Legal Affairs, Ministry of Environment is the DNA of Cambodia. **Japan (Annex 1 Party)**		OK

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			- Ratified the Kyoto Protocol on 4 June 2002. - The Liaison Committee for the Utilization of the Kyoto Mechanisms Ministry of Foreign Affairs, Climate Change Division, International Cooperation Bureau.		
A.2.4. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/ 1/	DR I	The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA. This has been confirmed by the DNA of Cambodia.		OK
A.3. Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
A.3.1. Does the project design engineering reflect current good practices?	/ 1/	DR I	The project design reflects current good practices. The proposed project consists of an anaerobic reactor digestion system which is designed to reduce wastewater BOD and COD by 85% and 70% respectively. Methane released by the anaerobic treatment of the wastewater will be captured by the digester and supplied to a biogas-fuelled generator for electricity generation. Surplus electricity will be sold to REE (Rural Electricity Enterprise).	~~CL 3~~	OK

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			Further description/ evidence from the supplier of the technology is needed with regards to the following; - type of technology provided - capability to reduce COD and BOD content from the wastewater - tolerable range of temperature and changes of ambient temperature - operational lifetime of the digester/ plastic cover Also, further information on the treatment of effluents from the digester is needed. (This has been addressed in PDD Version 3 dated 16 September 2008)		
A.3.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/ 1/	DR I	The technology being used by the project is a well proven technology and is expected to significantly increase the wastewater quality over the previous treatment system in open lagoons.		OK
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/ 1/	DR I	The project design has indicated that operator personnel will receive the necessary training required to operate and maintain the project activity. Training must be implemented before the start of the project activity.		OK
A.4. Contribution to Sustainable Development *The project's contribution to sustainable development is*					

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assessed.					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/ 1/ / 2/	DR I	Confirmation from the DNA of Cambodia that the project is in line with the sustainable development policies of Cambodia is pending.	~~CAR 1~~	OK
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/ 1/	DR	The project will result in better environmental conditions by further improving the effluent quality discharged to local watercourses and reducing odour from the open lagoons.		OK
A.5. Small scale project activity *Tit is assessed whether the project qualifies as small-scale CDM project activity*					
A.5.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/ 1/ / 5/ / 6/	DR	The project qualifies as a type-I small scale CDM project activity as the project's biogas electricity generation sets have a total generating capacity of 200kW, which is less than the threshold value of 15MW. The project also qualifies as a type-III small scale CDM project activity as the project results in emission reductions of less than 60kt CO_2e per year.		OK
A.5.2. Is the small scale project activity not a debundled component of a larger project activity?	/ 1/	DR	The project activity is not a debundled component of a larger project activity as there is not other small scale project activity: - With the same project participant, and - In the same project category, and		OK

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			- Registered within the previous 2 years, and - Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.		
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/ 1/ / 5/ / 6/	DR	The project applies the approved small scale baseline methodologies: - AMS-III.D, "*Methane recovery in agricultural and agro industrial activities*", version 13 EB 33, - AMS-I.A, "*Electricity generation by the user*", version 12 dated EB 33, and - AMS-I.D, "*Grid connected renewable electricity generation*", version 12 dated EB 33. (Reference to AMS I.D is removed in the revised PDD Version 3 dated 16 September 2008)		OK
B.1.2. Are the applicability criteria in the baseline	/ 1/	DR	The project fulfills the applicability criteria	~~CL 4~~	OK

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methodology all fulfilled?			for AMS-III.D: - It comprises of methane recovery from manure by installing methane recovery and combustion system to an existing source of methane emissions, - Methane emissions reductions resulting from the project activity will be less than 60,000 tCO_2e per year. The project fulfills the applicability criteria for AMS-I.A and I.D: - It involves the installation of a biogas-fuelled electricity generation set which will displace electricity from fossil fuel fired generating units. - The electricity generation set has a total generating capacity of 200kWe which is below the 15MW threshold limit. AMS IA cannot be applied for users that do have a grid connection. The PDD states that there is no grid connection, but at the same time electricity will be distributed to the REE. Further clarification is needed to conclude on whether AMS ID or AMS IA is applicable for this project activity. (This has been addressed in PDD Version 3 dated 16 September 2008)		

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B.2. Baseline Scenario Determination *The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.*					
B.2.1. What is the baseline scenario?	/ 1/	DR	The baseline scenario is the continued treatment of wastewater through the use of open anaerobic lagoons and release of methane into the atmosphere. In the absence of the project, the farm consumes electricity from fossil fuel fired generating units.		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/ 1/	DR	Identification of alternative scenarios is not required in AMS.I.A and AMS-III.D. The baseline scenario is defined as the continued treatment of wastewater through the use of open anaerobic lagoons and release of methane into the atmosphere. In the absence of the project, the farm consumes electricity from fossil fuel fired generating units. This is confirmed to be a likely baseline scenario by the Cambodian DNA.		OK
B.2.3. Has the baseline scenario been determined according to the methodology?	/ 1/	DR	Yes. The baseline is in accordance with AMS.I.A and AMS-III.D.		OK
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/ 1/	DR	The discussion of the baseline selection has been done in a transparent manner. The lower of the two values is selected as the baseline emission for the methane capturing		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			component of the project activity: (a) Actual monitored amount of methane captured and destroyed by the project activity. (b) The methane emissions calculated ex-ante using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity. .		
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/ 1/	DR I	Yes, relevant national and sectoral policies have been taken into account.		OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/ 1/	DR I	Yes, available data supports the argument that the treatment of wastewater in open anaerobic lagoons is the most common practice in Cambodia. This has been confirmed with the DNA of Cambodia.		OK
B.2.7. Have the major risks to the baseline been identified?	/ 1/	DR	There are no major risks identified to the baseline.		OK
B.3. Additionality Determination *The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.*					
B.3.1. Is the project additionality assessed according to the methodology?	/ 1/	DR	The project proponent has used the barrier analysis for demonstrating the additionality	~~CL 5~~	OK

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			of the project. The additionality of the project is demonstrated through the existence of technological barrier and prevailing/common practice barrier. **Technological barrier:** Methane extraction projects have shown mixed results in other projects, while being exposed to uncertainties such as insufficient gas for gas engines, shortage of skilled operators and design engineers for biogas plants were reported to be the barriers faced by the project. Evidence should be provided to substantiate these argumentations. **Prevailing / common practice barriers:** It has been demonstrated that open lagoon treatment is the prevalent wastewater treatment method in Cambodia. Most of the large swine farms use the open lagoon system, while electricity in the farms are generated by diesel fired generators.. It has been confirmed with the DNA of Cambodia that the open lagoon system is the common practice and it complies with the prevailing legal requirements. It was argued that extra income from CER sales could make up for poor technical		

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			performance in this project. Further elaboration is needed on how CDM incentives will help make the project viable. More evidences are also needed on the economics of the project, i.e. revenues from sale of electricity, expected costs and savings due to the project to substantiate the claim that the barriers inhibit the implementation of the project. Uncertainties such as insufficient gas for gas engines, shortage of skilled operators and design engineers for biogas plants were reported to be the barriers faced by the project. Evidence should be provided to substantiate these arguments and the difficulties faced by the project. (These have been addressed in PDD Version 3 dated 16 September 2008)		
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/ 1/	DR	Refer to B.3.1. The assumptions related to the investment barriers, prevailing practices and the technological risks were clearly stated and are acceptable. (This has been addressed in PDD Version 3 dated 16 September 2008)	~~CL 5~~	OK

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B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/ 1/	DR I	Yes. Evidence of the prevailing manure management methods in Cambodia was clearly referenced.		OK
B.3.4. If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/ 1/	DR	The project activity will begin on 1 September 2007, which is after the date of validation. It was confirmed during the follow-up interviews that the digester has been constructed and is waiting for the methane gas to accumulate before the commissioning of the gas generator. The starting date in the PDD should be amended to reflect the actual dates of commissioning date and/or the construction date. The starting date of the project activity has been revised to 15 April 2007, which is the start date of construction.	~~CL 6~~	OK
B.4. Calculation of GHG Emission Reductions – Project emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/ 1/	DR	Electricity generation component using methodologies AMS-I.A and I.D: No project emissions from these	~~CL 7~~	OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			methodologies are required. Methane recovery using methodology AMS-III.D: Project emission may result from the consumption of fossil fuel or grid electricity for the operation of the facility (proposed project). Approximately 10% of the electricity generated by the project will be parasitic load used to operate the facility. There are no project emissions associated with the project activity. Should the project activity result in the use of fossil fuel, the quantity of fossil fuel used should be monitored and deducted from the baseline emission. (This has been addressed in PDD Version 3 dated 16 September 2008)		
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/ 1/	DR	No project emissions are anticipated from the project activity. Refer to B.4.1.		OK
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/ 1/	DR	There are no major uncertainties in the project emission estimates.		OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions *It is assessed whether the baseline emissions are stated*					

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according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/ 1/	DR	The baseline emission boundaries cover the emissions from the open lagoons and the emissions from the electricity consumption. **Emissions from STAH diesel generators:** The project is estimated to displace 390 109kWh of electricity from diesel-fuelled generator per year. References for the values used in the calculations were shown in Section B.6.3 of the PDD. The baseline emissions for electricity generation from STAH diesel generators are 507tCO2e/year. In accordance with AMS-III.D, emissions should be assessed ex-post for each year during the crediting period and the lower of the below two values is selected: (a) Actual monitored amount of methane captured and destroyed by the project activity. (b) The methane emissions calculated ex ante using the amount of the manure that would decay anaerobically in the absence of the project activity, with the most recent IPCC tier 2 approach. This needs to be included in the monitoring plan of the PDD.	~~CL 8~~ ~~CL 9~~ ~~CL 10~~	OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			The reference page number mentioned in Section B.6.3 of the PDD to AMS-IA should have been paragraph 17 and 20 respectively, instead of 21 and 19 of PDD. The efficiency of the biogas engine of 38% is claimed in the PDD. This is deemed likely and actual electricity generated will be monitored ex-post. **Emissions from Rural Electricity Enterprise (REE) diesel generators:** The project is expected to export 600 529 kWh/year of electricity to the REE. The emission coefficient was selected from Table I.D. of the AMS.I.D methodology. Emission reductions due to the displacement of grid electricity were correctly calculated by multiplying the expected quantity of electricity exported by the project with an emission coefficient for a modern diesel generating unit, 1.3kgCO_2e/kWh. The baseline emissions for electricity generation for REE are 781tCO2e/year. During follow-up interviews, it was reported by the project participant that the community is receiving electricity from diesel powered battery recharging shops. Furthermore the		

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			project activity claims that the emission factor used, 1.3kgCO_2e/kWh, is representative for the diesel generator systems in the baseline. However, further justification is requested for the selection of the emission factor that would occur in the baseline scenario. Further specifications of the existing diesel generators at STAH is needed with regards to; - capacity and efficiency - remaining operational lifetime - how they will be used after project implementation (removed following the decision from the PP to exclude the REE grid from the project boundary) **Emissions from the Open Lagoon:** Ex post calculation of baseline emissions from the open lagoon are clearly documented in Section B.6.3 of the PDD. The baseline emissions from the open lagoon are 5 504 tCO2e/year. It was confirmed during follow-up interviews that the swine population has decreased from 15400 swines as of the PDD to 14200 in August 2007. Historical swine population		

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			should be tabulated for transparency purposes and the conservativeness of the value of 15400 swines should be justified. (This has been addressed in PDD Version 3 dated 16 September 2008)		
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/ 1/	DR	The baseline has been determined using a value of 0.29 $m^3CH_4/kgVS$ for B_0 and 0.8 (fraction, no unit) for MCF. Both of these assumptions were based on conservative assessments of IPCC default values. References for the values used in the calculations were shown in Section B.6.3 of the PDD. However, further information on the dimension, depth and size of the existing lagoons is needed to conclude on the use of B_o. (This has been addressed in PDD Version 3 dated 16 September 2008)	~~CL 11~~	OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/ 1/	DR	The uncertainty in the baseline estimates is the possible drastic decrease in the swine population which will decrease the amount of methane generated. However actual methane captured and utilized for electricity generation will be monitored ex-post.		OK
B.6. Calculation of GHG Emission Reductions –					

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CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Leakage *It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/ 1/	DR	No leakage needs to be accounted for as the project equipments are not transferred from another activity as outlined in type-I.A and I.D. For type-III.D, the methodology does not require any leakage calculation.		OK
B.7. Emission Reductions *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.*					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/ 1/	DR	Yes, the project is estimated to result in 6 792 tCO_2e emission reductions per year over its crediting period. The revised PDD estimates the project will achieve emission reduction of approximately 6 262 tCO_2e per year. (Following a request for review, the PP has remove sections in the PDD mentioning supply of electricity to the REE grid, CERs associated with the export of power production has been removed as well. The revised PDD estimates the project will		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			achieve emission reduction of approximately 5 593 tCO_2e per year.)		
B.8. Monitoring Methodology *It is assessed whether the project applies an appropriate monitoring methodology.*					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	/ 1/	DR	The monitoring plan is in accordance with the approved monitoring methodologies: - AMS-I.A, *"Electricity generation by the user"*, version 12 dated 10 August 2007, - AMS-I.D, *"Grid connected renewable electricity generation"*, version 12 dated 10 August 2007, and - AMS-III.D, *"Methane recovery in agricultural and agro industrial activities"*, version 13 dated 10 August 2007. (Reference to AMS I.D is removed in the PDD Version 3 dated 16 September 2008)		OK
B.8.2. Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/ 1/	DR	The archiving period for the monitoring data was not stated in the PDD. All monitoring data should be kept for at least two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later. (This has been addressed in PDD Version 2	~~CL 12~~	OK

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CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			dated 6 November 2007)		
B.9. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/ 1/	DR	Yes. The following monitoring data will be collected for the estimation of project emissions: - Final sludge handling in the project activity Although the project activity is not anticipated to consume diesel consumption, however, if under any circumstances that consumption of diesel is required, the amount of diesel consumed should be monitored. This was not included in the monitoring plan. Furthermore, as per the requirement of AMS-III-D paragraph 17, "on site inspection for each individual farm included in the project boundary" was not included in the monitoring plan. (This has been addressed in PDD Version 3 dated 16 September 2008)	~~CL 7 CAR 2~~	OK
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/ 1/	DR	CH_4 and CO_2 are the GHG indicators that need to be considered and this has been taken into account.		OK

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CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.9.3. Is the measurement method clearly stated for each GHG value to be monitored and deemed appropriate?	/ 1/	DR	Yes. Measurement method is listed in the Monitoring Plan and is deemed appropriate.		OK
B.9.4. Is the measurement equipment described and deemed appropriate?	/ 1/	DR	Yes. Sales receipt of final sludge is used as measurement equipment and is deemed appropriate. Further description on how the sludge will be handled aerobically to avoid methane emissions is required. (This has been addressed in PDD Version 3 dated 16 September 2008)	~~CL 13~~	OK
B.9.5. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/ 1/	DR	Procedures for addressing erroneous measurement were not identified in the project design. The procedures should be developed and implemented prior to the start of the crediting period and need to be checked during the first periodic verification.		OK
B.9.6. Is the measurement *interval* identified and deemed appropriate?	/ 1/	DR	Yes. Measurement intervals for the monitoring parameters are identified.		OK
B.9.7. Is the *registration*, *monitoring*, *measurement* and *reporting* procedure defined?	/ 1/	DR	Procedures for registration, monitoring, measurement and reporting were not identified in the PDD. The procedures should be implemented prior to the start of the crediting period and be checked during the		OK

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CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			first periodic verification.		
B.9.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/ 1/	DR	Procedures for maintenance and calibration of monitoring equipment were not identified in the PDD. The procedures should be implemented prior to the start of the crediting period and be checked during the first periodic verification.		OK
B.9.9. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/ 1/	DR	The monitoring plan contains descriptions of the record handling procedures. The procedures should be established and implemented prior to the start of the crediting period and be checked during the first periodic verification.		OK
B.10. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete baseline emission data over time.*					
B.10.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/ 1/	DR	Yes. The following monitoring data will be collected for the estimation of baseline emissions: 1. Fraction of methane in biogas ($F_{CH4\_captured}$), 2. Temperature of biogas combusted (T_{biogas}), 3. Pressure of biogas combusted (P_{biogas}), 4. Swine population in STAH Farm ($P_{swine,y}$), 5. Amount of electricity generated by the		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			project activity ($E_{gross,y}$), 6. Amount of electricity sold to the REE ($E_{REE,y}$), 7. Amount of electricity utilized by the farm ($E_{STAH,y}$), and 8. Amount of biogas recovered by the project activity ($BG_{burnt,y}$) These data will allow for the determination of baseline emissions during the crediting period.		
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/ 1/	DR	CH_4 and CO_2 are the only GHG indicators that need to be considered and both of them have been taken into account.		OK
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/ 1/	DR	The GHG values related to emission reductions will be monitored with the appropriate measurement equipment.		OK
B.10.4. Is the measurement *equipment* described and deemed appropriate?	/ 1/	DR	The monitoring equipments used for on-site measurements are indicated in the monitoring plan and are deemed appropriate.		OK
B.10.5. Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/ 1/	DR	Procedures to prevent possible data adjustments have not been identified. This needs to be implemented at the latest prior to the start of the crediting period to enable subsequent verification of emission		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			reductions and be checked during the first periodic verification.		
B.10.6. Is the measurement *interval* for baseline data identified and deemed appropriate?	/ 1/	DR	The measurement intervals are in accordance to the requirements of AMS-I.A, AMS-I.D and AMS-III.D.		OK
B.10.7. Is the registration, *monitoring, measurement* and *reporting* procedure defined?	/ 1/	DR	Procedures for registration, monitoring, measurement and reporting were not identified in the PDD. The procedures should be implemented prior to the start of the crediting period and be checked during the first periodic verification.		OK
B.10.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/ 1/	DR	Procedures for maintenance and calibration of monitoring equipment were not identified in the PDD. The procedures should be implemented prior to the start of the crediting period.		OK
B.10.9. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/ 1/	DR	Procedures for record handling were not identified in the PDD. The procedures should be implemented prior to the start of the crediting period.		OK
B.11. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/ 1/	DR	No leakage monitoring needs to be accounted for as the project equipments are not		OK

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			transferred from another activity as outlined in type-I.A and I.D. For type-III.D, the methodology does not require any leakage monitoring.		
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/ 1/	DR I	Yes. The Cambodian DNA presents a document regarding sustainable development (SD) indicators and the project must meet Cambodia's sustainable development objectives. This was verified during the DNA interview		OK
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/ 1/	DR I	Sustainable development criteria developed by the DNA of Cambodia are as follows: a) Contribution to environmental protection, b) Social benefit to the neighbouring community, c) Technology transfer, and d) Economic benefit Methane avoidance by the project is in line with the SD criteria a) and providing electricity to the neighboring community is in		OK

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			line with the SD criteria b) This was verified during the DNA interview		
B.12.3. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/ 1/	DR I	The project is the first of its kind in Cambodia and is in line with the SD criteria c), and the Project displaces the use of diesel oil and decreasing dependency on imported fossil fuels this it's supposed to be in line with the SD criteria d) This was verified during the DNA interview		OK
B.13. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/ 1/	DR I	The authority and responsibility for the project management has been addressed. Key functions already identified are the general manager, plant manager, CDM consultant and operators.		OK
B.13.2. Are procedures identified for training of monitoring personnel?	/ 1/	DR I	Operator personnel will be trained in equipment operation, data recording, and reporting. The training should be carried out before the commencement of project and be checked during the first periodic verification.		OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can	/ 1/	DR I	No such emergencies were identified. It is unclear if such emergencies are likely to	~~CL 14~~	OK

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cause unintended emissions?			occur. It is unclear if emergencies that can affect the emission reductions are likely to occur. If yes, emergency preparedness procedures should at the latest is implemented prior to commencement of the project. (This has been addressed in PDD Version 3 dated 16 September 2008)		
B.13.4. Are procedures identified for review of reported results/data?	/ 1/	DR I	Procedures for internal review of reported data were not identified in the PDD. The procedures should be developed and implemented before the start of the crediting period and be checked during first periodic verification.		OK
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/ 1/	DR I	Procedures for corrective actions were not identified in the PDD. The procedures should be developed and implemented before the start of the crediting period and be checked during first periodic verification.		OK
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and evidenced?	/ 1/	DR	The project activity will begin on 1 September 2007. Its operational life time is expected to be 15 years. The project starting date should be updated.	~~CL 6~~	OK

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			(This has been addressed in PDD Version 2 dated 6 November 2007)		
C.1.2. Is the start of the crediting period clearly defined and reasonable?	/ 1/	DR	The crediting period is estimated to start on 1 December 2007. Since the project is yet to be registered, the start date of the crediting period should be delayed as the crediting period can only start after the registration of the project. (This has been addressed in PDD Version 3 dated 16 September 2008)	~~CL 15~~	OK
D. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
D.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?	/ 1/	DR I	An environmental impact assessment (EIA) was not required for this project under Cambodia law. - It was verified during the DNA interview		OK
D.1.2. Does the project comply with environmental legislation in the host country?	/ 1/	DR I	The project conforms to all applicable legal requirements in Cambodia. - It was verified during the DNA interview		OK
D.1.3. Will the project create any adverse environmental effects?	/ 1/	DR	The project is not likely to create any significant adverse environmental effect. It was observed during the site visit that Cambodia is subjected to long periods of rain during the monsoon season, causing flood in		OK

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			the surrounding area of the project activity. There is a risk of effluent from the existing lagoons overflowing into underground water, wells or nearby river. However, it is not expected that the project will increase the risk of flooding.		
D.1.4. Have environmental impacts been identified and addressed in the PDD?	/ 1/	DR	Four environmental aspects of a wastewater treatment plant have been identified. These relate to noise, odour, emissions of gaseous pollutants, and safety. None of these are of significance in context of the project.		OK
E. Stakeholder Comments *The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.*					
E.1.1. Have relevant stakeholders been consulted?	/ 1/	DR	The relevant stakeholders identified for the project are the Samrong Thom and neighboring communes, local school and village residents. These stakeholders have been consulted.		OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/ 1/	DR	Comments by local stakeholders were obtained through a stakeholder consultation meeting held in Samrong Thom Animal Husbandry on the 29th April 2007.		OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/ 1/	DR I	A stakeholder consultation is not required by the DNA of Cambodia. Nevertheless, a stakeholder consultation has been carried out since it is the common method of establishing		OK

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			the social benefits and sustainability criteria for the project. The comments received have been summarised. This was verified during the DNA interview		
E.1.4. Is a summary of the stakeholder comments received provided?	/ 1/	DR I	A summary of the concerns raised during the stakeholder consultation and the responses from the project proponent have been verified by DNV during follow-up interviews.		OK
E.1.5. Has due account been taken of any stakeholder comments received?	/ 1/	DR	No adverse comments were received.		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CAR 1 The Letters of Approval from the DNA of Cambodia and Japan are pending.	Table 1 A.2.2. A.2.3.	Letter of Approval from Cambodian and Japanese DNA has been obtained.	Letters of Approval from DNA of Cambodia and Japan were both obtained on 15 October 2007. CAR 1 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CAR 2 On site inspection for the farm included in the project boundary, as per paragraph 17 of AMS-III.D methodology was not included in the monitoring plan.	B.9.1.	Section B.7.1 of the PDD was revised to include the on site inspection for each individual farm included in the project boundary.	On site inspection have been included in Section B.7.1 of the revised PDD. CAR 2 is closed.
CL 1 A more specific location such as the coordinates of the project location needs to be included to ensure unique identification of the project activity.	A.1.1.	PDD was revised to include site coordinates in Section A.4.1.4.	Coordinates of the project activity are 11°23'40.86"N latitude, and 105°13'52.76"E longitude. The coordinates have been included in the revised PDD. CL 1 is closed.
CL 2 It was reported during follow-up interviews that currently there are no agreement in place to sell or connect the excess electricity from the project activity to the grid. Hence it is unclear to how the project activity is going to claim CERs from the displacement of electricity from the REE. Clarification is sought to justify the decision to claim emission reductions from the sale of excess electricity.	A.1.2	Sections A.2 and A.4.2 of the PDD was revised accordingly to indicate that supply of excess electricity to REE will be phase 2 of the Project, which will be implemented once it has been confirmed that methane generation from the wastewater treatment is sufficient.	The PDD has been revised to indicate that the supply of electricity to REE will be confirmed in phase 2 of the project. However, the PP does not have a concrete plan or provision to undergo the export of excess electricity. Hence, the decision is not firm and this shall be verified during the first verification. CL 2 is closed.
CL 3 Further specification/ evidence from the supplier of the technology is needed with regards to the following;	A.3.1	Section A.4.2 of the PDD was revised to include references to both capability and temperature profiles of the bio-digester.	OK. The information has been included in the revised PDD. The validation team was able to verify through the Feasibility Study referenced by the

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
- type of technology provided - capability to reduce COD and BOD content from the wastewater - tolerable range of temperature and changes of ambient temperature - operational lifetime of the digester/ plastic cover Further information on the treatment of effluents from the digester is needed.		The HDPE supplier guarantees operational lifetime of at least 15 years. Section A.4.2 of the PDD was revised to reflect subsequent treatment of effluent from the bio-digester. Information from the supplier of STAH's anaerobic reactor indicates that the anaerobic digestion can occur in the widely range of temperature, between 4 and 60 degree Celsius. This information was obtained verbally. If so, the reactor should not face difficulty in the ambient temperatures seen in the Phnom Penh area, average monthly minimum / maximum of 21 to 35 degC respectively; lowest / highest recorded at 14 to 41 degC respectively.	Project Proponent, the anaerobic digester has the capability to remove more than 85% of the BOD and 70% of the COD. Furthermore, with proper maintenance, the HDPE supplier guarantees operational life time of at least 15 years. The subsequent effluent will be transferred to the second and third lagoon, both having depths of more than 4m. This has been reflected in the revised PDD. It has been confirmed through checks with the referenced meteorological data in the PDD that the average temperature in Phnom Penh is 27^{o}. The anaerobic reactor is not expected to face difficulty operating under the ambient conditions in Phnom Penh. CL 3 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 4 AMS IA cannot be applied for users that do have a grid connection. The PDD states that there is no grid connection, but at the same time electricity will be distributed to the REE. Further clarification is needed to conclude on whether AMS ID or AMS IA is applicable for this project activity.	B.1.2	PDD was revised to apply AMS-I.A for the project activity. STAH piggery farm as well as the neighboring communities does not have grid connection. The REE, a private distributor, that the surplus electricity will be sold to, will serve as an isolated mini-grid to displace local residents' use of battery for power source.	The PDD has been revised to indicate that the supply of electricity to the isolated mini-grid REE will be confirmed in phase 2 of the project. However, the PP does not have a concrete plan or provision to undergo the export of excess electricity. Hence, the decision is not firm and this shall be verified during the first verification. CL 4 is closed.
CL 5 Further elaboration is needed on how CDM incentives will help make the project viable. More evidences are also needed on the economics of the project, i.e. revenues from sale of electricity, expected costs and savings due to the project to substantiate the claim that the barriers inhibit the implementation of the project. Uncertainties such as insufficient gas for gas engines, shortage of skilled operators and design engineers for biogas plants were reported to be the barriers faced by the project. Evidence should be provided to substantiate these arguments and the	B.3.1. B.3.2.	STAH has been attending CDM seminars since 2005. From the early stages of considering this project, it has been conceived as a CDM project. Without the incentive of additional revenues from sale of CERs, STAH would not have gone ahead with the project, and kept their focus on their key business of producing pigs. We have not used detail of the projects costs and revenues in the PDD because the investment barrier is not used to establish additionality. Our understanding is that financial analysis is just one of the options available to project participants to establish additoinality. In this case we have	It was explained during follow-up interviews that the additional income from CER sales and possible power sales to REE would enable the PP to take on a risky and first of its kind project. In the event of the project facing unexpected costs due to breakdown of equipment and calling of maintenance engineers from neighbouring countries, the additional revenue from the CDM will justify the repairing of such equipment, and continued operation of the project. A copy of the agenda for the workshop on manure management and a copy of agenda related to biogas utilization hosted by the Ministry of Environment

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
difficulties faced by the project.		established the technology and prevailing practice barriers, and that the project is the first of its kind in Cambodia. We have surveyed the five most recent biogas projects to have CERs issued The projects have an average of 42% issued:estimated CER ratio, from 38% minimum to 45% maximum. This clearly shows that projects of this nature are not achieving ex ante estimated emission reduction targets stated in the PDD. Further, the operators' training has been limited to a visit to a demonstration project in Thailand by the farm's general manager and some explanations of key safety procedures when the key components were delivered. The Cambodian DNA, during their interview with the DOE, stated that this was the first project of its kind in Cambodia; as a first of its kind project, it is reasonable to assume, per se, that there is a lack of skilled and experienced personnel available in the country.	to substantiate the farm owner's awareness in CDM project as early as 26 July 2005 and 29 September 2005 respectively were provided to the validation team. Hence, it was sufficiently demonstrated that the project developers considered the benefits from carbon credits before implementation of the project activity. During follow-up interviews, a spreadsheet showing the five most recent biogas projects with issued CERs located in South America, provided by the project proponents indicates that biogas capture projects from animal waste projects have not reached the potential emission reduction targets estimated ex-ante during validation stage. Although the project activity could also face similar uncertainties such as insufficient biogas, relevant project management procedures should be revised if needed for better project management of the digester and biogas collection system. Project management and maintenance procedures are to be

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
			checked during first periodic verification. Furthermore, it was confirmed during follow-up interview with the DNA of Cambodia that the project activity is the first of its kind in the country, and is likely to face shortage of skilled workers in handling day-to-day operations of the biogas system. CL 5 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 6 It was confirmed during the follow-up interviews that the digester has been constructed and is waiting for the methane gas to accumulate before the commissioning of the gas generator. The starting date in the PDD should be amended to reflect the earliest date of implementation, construction or real action.	B.3.4. C.1.1	Section C.1.1 of the PDD was revised to reflect the starting date of construction.	The starting date of the project activity is 15 April 2007, which is the start date of construction. CL 6 is closed.
CL 7 The diesel generators are kept as back-up. This was not included in the monitoring plan. Should under any circumstances the consumption of diesel be required, the amount of diesel consumed should be monitored. This was not included in the monitoring plan.	B.4.1, B.9.1.	As explained in Section A.4.2 and CL4, the existing diesel generators will be used should there be lack of biogas production or problems with the gas engines. In this case, diesel used for the existing generators is outside the project boundary. As required, Section B.7.1 of the PDD was revised to include fossil fuel use for the project activity. This is done for contingency purposes. Please note that such use of fossil fuels is highly unlikely, as there is no allowance for such use of fossil fuel in the project plan.	Amount of fossil fuel consumed will be monitored ex-post. This has been included in Section B.7.1 of the revised PDD. CL 7 is closed.
CL 8 According to AMS.I.A methodology, "the	B.5.1	Section B.6.3 of the PDD was revised accordingly to reflect calculations as per	Corrections have been made to the revised PDD for the calculation as per

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
amount of electricity generated using biomass fuels calculated as per paragraph 17 (metered electricity generation) shall be compared with the amount of electricity generated calculated using specific fuel consumption and amount of each type of biomass fuel used. The lower of the two values should be used to calculate emission reductions." This should be included in the monitoring plan. The reference page number mentioned in the PDD to AMSIA should have been paragraph 17 and 20 respectively, instead of 21 and 19 of PDD.		methodology paragraph 20 of AMS-I.A. Section B.6.3 of the PDD was revised to mention correct reference to paragraphs 20 and 17 of AMS-I.A (version 12) accordingly.	paragraph 20 of AMS-I.A and references to paragraphs 20 and 17 of AMS-I.A (version 12) respectively. CL 8 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 9 During follow-up interviews, it was reported by the project participant that the community is receiving electricity from diesel powered battery recharging shops. Furthermore the project activity claims that the emission factor used, 1.3kgCO_2e/kWh, is representative for the diesel generator systems in the baseline. However, further justification is requested for the selection of the emission factor that would occur in the baseline scenario. Further specifications of the existing diesel generators at STAH is also needed with regards to; - capacity and efficiency - remaining operational lifetime - how they will be used after project implementation	B.5.1.	Section 5.3 of the "Feasibility Study of a Methane-fired Power Generation Plant in Kien Svay District, Kandal Province" shows that there are two family owned battery charging stations located within 2km of the piggery farm which supplies to surrounding villages. Both battery charging station use diesel generators with 15 Hp capacities (about 11kW). In the PDD, the emission factor used was 1.3kgCO_2e/kWh, which covers the range of 35-135kW diesel generators, which is more than actual capacities of battery charging stations, for conservativeness. Section B.6.3 of the PDD was revised to reflect this. As stated in Section A.4.2 of the PDD, STAH currently has four operational diesel generators. The newest of which was bought in September 2006. Aside from this, STAH has several diesel generators which are under various states of repair. As evident during the DOE site validation, it is apparent that even if the old generators have surpassed their designed lifetime, STAH will continue to use these	The characteristics of the battery charging stations in the project vicinity were tabulated in the Feasibility study. The validation team was able to verify from the study that the diesel generators have 15HP capacities (about 11kW), thus the emission factor of 1.3kgCO_2e/kWh, applicable for the range of 35-135kW, is deemed conservative and in line with AMS I.A version 12. The validation team was also able to verify during the site visit that the diesel generators used in the piggery farm are combination of old and newer generators. Specifications of the four existing operational diesel generators have been included in Section A.4.2 of the revised PDD. CL 9 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		generators. STAH will continue to repair these old generators should they break down, as these will be their only source of electricity. It is essential that STAH has several working generator units on stand by as backup to the operational generators. Section A.4.2 of the PDD was revised to include capacities of existing generators, and explain what will happen to the existing generators upon project implementation.	
CL 10 It was confirmed during follow-up interviews that the swine population has decreased from 15 400 swine as of the PDD to 14 200 in August 2007. Historical swine population should be tabulated for transparency purposes and the conservativeness of the value of 15400 swine should be justified	B.5.1	PDD was revised accordingly to include information on historical swine population, and use the average swine population for the year 2006 for calculation purposes as this is the latest complete annual population of the farm available.	OK. A one year swine population has been included in the revised PDD. The validation team was able to verify through historical swine population records that the highest population is in the month of October i.e. 15 420 with the lowest in the month of February i.e. 13 864, with an average of 14 774 per month applied in ex-ante emission reduction estimation. CL 10 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 11 Further information on the dimension, depth and size of the existing lagoons is needed to conclude on the use of B_0.	B.5.2	Section A.4.2 of the PDD was revised to indicate dimensions of existing lagoons.	OK. The dimension of the lagoons has been included in the revised PDD and is found satisfactory. CL 11 is closed.
CL 12 The archiving period for the monitoring data was not stated in the PDD.	B.8.2.	Section B.7.1 of the PDD was revised to include the archiving period for the monitoring data.	OK. The archiving period of a minimum of 2 years after the end of the crediting period or the last issuance of CERs, whichever is later, was chosen. This is reflected in the revised PDD. CL 12 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 13 Justification is also needed to show that the sales receipt of final sludge collected is sufficient for the monitoring of sludge.	B.9.4.	As the final sludge will be sold to local farmers, it will be to the best interest of both parties (STAH and sludge buyer) to ensure that proper sludge amount and cost are indicated in the receipt. And considering that the sludge will be bought by farmers, this ensures that the farmers will use the sludge for productive purposes, which is as soil fertilizer.	Sludge from the wastewater treatment system will be land applied. The dried sludge will be collected and used as soil fertilizer. By spreading a thin layer of sludge in the open field and left to dry under the sun, it will ensure the methane emissions resulting from sludge will be minimal. The monitoring of sludge will enable subsequent verification of emission reductions. CL 13 is closed.
CL 14 It is unclear if emergencies that can affect the emission reductions are likely to occur. If yes, emergency preparedness procedures should at the latest is implemented prior to commencement of the project.	B.13.3.	Emergency preparedness procedures will be implemented accordingly once proper training is provided by the technology supplier. Diesel generator operators are already aware of emergency procedures for the engines. And, as a minimum, fire extinguishers are present for such emergencies.	OK. The procedures will at the latest be implemented prior to commencement of the project and should be verified during first periodic verification CL 14 is closed.
CL 15 Since the project is yet to be registered, the start date of the crediting period should be delayed as the crediting period can only start after the registration of the project.	C.1.2.	Section C.2.1.1 of the PDD was revised to reflect this point.	OK. The starting date of the crediting period has been revised. This is reflected in PDD version 2. CL 15 is closed.

APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Michael Lehmann

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	Yes	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 1, 2, 3 & 9		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	*AM0027*	Yes
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029, AM0045	Yes	*AM0030*	Yes
ACM003, ACM0005, AM0033, AM0040	Yes	*AM0031*	Yes
ACM0004	Yes	*AM0032*	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	*AM0035*	Yes
ACM0007	Yes	*AM0038*	Yes
ACM0008	Yes	*AM0041*	Yes
ACM0009, AM0008, AMS-III.B	Yes	*AM0034*	Yes
AM0006, AM0016, AMS-III.D, ACM0010	Yes	*AM0043*	
AM0009, AM0037	Yes	*AM0046*	
AM0013, AM0022, AM0025, AM0039, AMS-III.H, AMS-III.I	Yes	*AM0047*	
AM0014	Yes	*AMS-II.A-F, AM0044*	Yes
AM0017	Yes	*AMS-III.A*	Yes
AM0018	Yes	*AMS-III.E, AMS-III.F*	Yes
AM0020	Yes		
AM0021, AM0028, AM0034, AM0051	Yes		
AM0023	Yes		
AM0024	Yes		

Høvik, 5 February 2007

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Mari Grooss Viddal

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes		
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029, AM0045	Yes		

Høvik, 26 September 2007

Michael Lehmann
Technical Director, International Climate Change Services

CERTIFICATE OF COMPETENCE

Ramesh Ramachandran

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	Yes	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 4, 5, 13		
Technical Reviewer for (group of) methodologies:			
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029, AM0045	Yes		

Høvik, 22 December 2006

Einar Telnes
Director, International Climate Change Servicer

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Chee Keong Lai

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 30 October 2007

Michael Lehmann
Technical Director, International Climate Change Services

CERTIFICATE OF COMPETENCE

Siew Sit Denise Lai

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	--	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 5 February 2007

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Yon Sing (Simon) Wong

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	--	***JI Validator:***	Yes
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 30 November 2007

Michael Lehmann
Technical Director, International Climate Change Service