



**Training-Workshop on CDM Post-registration Changes (PRCs)
and Programme of Activities (PoAs)
12-14 February 2014 - Pretoria, South Africa**

PRC Case Study 1 – Change in project design

Guidance to carry out the case study

- Read the relevant information on the PoA and the reference regulatory documents provided for the case study.
- After reading the documents, discuss the questions asked within your group and then try to answer them individually.
- A plenary discussion will follow where selected members of your group can present your results.
- The facilitators will comment on your results and compare them with the ones suggested by the UNFCCC secretariat.

Case Study 1a

• **The project background**

The proposed project activity is a landfill gas project located in Barbados that installs, at an initial stage, an efficient LFG gas collection and flaring system, and subsequently, subject to LFG availability and connection with the grid, a 3.0 MW electricity generator in order to supply electricity to the electricity grid.

The project's installed capacity in the registered PDD is mentioned as an estimated 2-3 MW, to be implemented over two phases (2 engines of 1MW in a first phase and a 3rd engine of 1 MW in a second phase) and subject to the successful execution of the Power Purchase Agreement with the Central Electricity Board. The maximum electricity generation capacity is 3 MW.

The electricity generation is limited by the quantity of LFG available, which cannot meet the demand of the 3MW installed capacity; therefore an increase in design capacity has no impact on the emission reductions.

Methodology applicability

The project meets applicability conditions (a) and (b) of ACM0001 ver. 11:

- (a) The captured gas is flared; and
- (b) The captured gas is used to produce energy (e.g. electricity/thermal energy)

Baseline

The atmospheric release of landfill gas or landfill gas is partially captured and subsequently flared.



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The electricity is obtained from an existing/new fossil based captive power plant or from the grid.

Additionality

Benchmark investment analysis is conducted.

Key assumptions used in financial analysis

	Parameters	Unit	Value
Electricity	Maximum capacity installed	MW	3
	Load factor	%	100%
	Online availability	%	75%
	Total salvage value of engines	US\$	226,027
	Electricity tariff	US\$ / MWh	126.00
Investment cost	Capex - Gas collection and flaring	US\$	508,697
	Capex - Electrical engines	US\$	2,333,519
	Capex - Other power generation costs	US\$	1,540,089
Operational costs	O&M costs per MWh	US\$/MWh	23
	Other variable costs	US\$/yr/MW installed	182,569
	Annual fixed costs - Electricity plant	US\$/yr	572,579
Other financial parameters			
	Income Tax	%	15%
	Debt ratio	%	70%
	Interest rate	%	11%
	Carbon price	US\$ / CER	15.00
	Discount rate	%	19.3%



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Financial results of the project with and without carbon revenues

Indicator	Without carbon revenues	With carbon revenues
Equity Net Present Value (USD)	-1,599,770	1,151,039
Equity IRR	-4.22%	36.38%
Discount rate / Benchmark used	19.34%	

Emission reduction (electricity generation component only)

$$ER_{EL,y} = (EL_{LFG,y} \times CEF_{elec,BL,y}) - (EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}))$$

Monitoring plan (electricity generation component only)

- EL_{LFG} - Net amount of electricity generated using LFG (measured continuously using an electricity meter)
- $CEF_{elec,BL,y}$ - Emission factor for the grid (ex-ante value)
- $EC_{PJ,y}$ - Onsite consumption of electricity provided by the grid and/or the captive power plant
- $EF_{EL,j,y}$ - Emission factor for electricity consumed (ex-ante value)
- TDL_y - Average technical transmission and distribution losses

• **The post registration change**

During the first verification, the DOE verified that:

- the actual power generation capacity installed by the project is 3.3 MW;
- the monitoring system is implemented as described in the registered monitoring plan.

The reason for the change in the installed capacity is the non-availability of the genset products with specific 1 MW nameplate capacity by the equipment provider. Therefore, the total installed capacity of the project was revised to 3.3 MW (1.1 x 3 MW) as opposed to 3 MW (3x1 MW) envisaged at the time of PDD development.

A clarification letter has been provided on November 2012 from the equipment supplier, stating that upon the request for a quote for the supply of two 1 MW gas gensets in November 2008, the closest rating available in that range was 1.1 MW which was the basis for the offer made.

• **Reference regulatory documents**

- a) *CDM Validation and Verification Standard (VVS) ver. 5.0, para 269 - 282*



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- b) Project Standard (PS) 5.0, para 224 - 228*
- c) Project Cycle Procedure (PCP) 5.0, para 130 -140*
- d) Methodology: ACM0001 ver. 11, page 2*

- **Questions:**

1. What are the impacts of the change on: i) application/applicability of the applied methodology; ii) compliance of monitoring plan with applied methodology; iii) level of accuracy and completeness in the monitoring of the project activity; and iv) scale of the project activity? (PS 5.0 para 225)
2. How should the PP demonstrate the impact on the project additionality? (PS 5.0, para 226 (a))
3. Does this case require prior approval or can it be submitted along with the issuance request? (PS 5.0, Appendix 1)



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Case Study 1b

- **The project background**

This is a project activity for addition of power capacity i.e., 25MW bagasse boiler is added to an existing 10 MW bagasse boiler in a sugarcane plant. It generates thermal and electricity power for captive use and for exporting (only 25 MW) to the national grid.

The total capacity of the plant is expected to be 37 MW out of which about 25 MW was to be exported to the grid. The design proposed in the registered PDD consisted of:

- operating an existing boiler (110t/hr, 21barg, 380oC) with an existing 7 MW alternator
- installing a new boiler (170 t/hr, 87 barg, 525oC) configured with two 2.5 MW existing alternators and a new 25 MW alternators.

Additionality is demonstrated using barriers:

- Investment barriers
- Technological barriers
- Prevailing practice barrier

- **The post registration change**

One 34.2MW turbo alternator has been installed in place of a 25MW turbo alternator.

The design actually implemented consists of:

- the operation of the existing boiler (110t/hr, 21barg, 380oC) with the existing 7 MW alternator
- the installation of new boiler (170 t/hr, 87 barg, 515oC) configured with a new 34.2 MW alternator

The reasons for the changes were mainly for overall energy efficiency improvement and to apply the latest technology. According to the PP, a shift from 45 bar to a higher steam pressure and temperature (87 bar) would result in higher energy efficiencies necessitating a bigger turbo generator which resulted in turbo-generator capacity increase from 25 to 34.2 MW.

The changes took place after the site visit by the validating DOE and at later stage of validation, and were unknown to the PP.



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- **Reference regulatory documents**

- CDM Validation and Verification Standard (VVS) ver. 5.0, para 269 - 282*
- Project Standard (PS) 5.0, para 224 - 228*
- Project Cycle Procedure (PCP) 5.0, para 130 - 140*
- Methodology: ACM0006 ver. 6, page 3*

- **Questions:**

1. What are impacts of the changes on: i) application/applicability of the applied methodology; ii) compliance of monitoring plan with applied methodology; iii) level of accuracy and completeness in the monitoring of the project activity; iv) additionality of the project; and v) scale of the project activity? (PS 5.0 para 225)
2. Does this case require prior approval or can it be submitted along with the issuance request? (PS 5.0, Appendix 1)



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Case Study 1c

- **The project background**

The project activity is an aerobic wastewater treatment system implemented in two poultry production units:

- Unit A processes an average of 170,000 birds daily, generating 4,400 m³ of wastewater; and
- Unit B processes an average of 150,000 birds daily, generating 3,300 m³ of wastewater.

The treatment system separates the wastewater sludge into three phases, as described below:

- Sludge or fat: dried by natural gas/oil boiler's combustion gases and burned in a special boiler to partially substitute natural gas;
- Oil: burned in a boiler to partially substitute natural gas; and
- Centrifuged liquid: sent to the equalization tank.

Additionality was demonstrated through investment analysis, considering a maximum poultry processing capacity at each unit of 216,000 birds daily (i.e a total capacity of 432,000 birds daily for the whole project). No other revenues are linked to the project activity, besides the saving from the replacement of the natural gas.

- **The post registration change**

During the initial two verifications of the project, there were technical problems with the boiler installed at Unit A and deviations were requested to approve alternative means of sludge disposal. Afterwards, the project developer installed on one site a new boiler capable to burn all the produced sludge as per the registered PDD, yet still wanted to revise the PDD and original monitoring plan to provide for possible future system failures.

The revised PDD describes that the sludge will be separated into three phases:

- sludge or fat: dried by natural gas/oil boiler's combustion gases and burned in a special boiler to partially substitute natural gas or other non-anaerobic final disposal;
- oil: burned in a boiler to partially substitute natural gas or other non-anaerobic final disposal; and
- centrifuged liquid: sent to the equalization tank.

The revised PDD also reflects an increase in poultry production (as shown in the figure below) and associated emission reductions.



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Max Installed Capacity	PDD page 3 (% of max IC)	Data 2010-2011 /5/ (% of max IC)	Production Increase
216 000	170 000 (79%)	189 000 (88%)	11.2%
216 000	150 000 (69%)	196 000 (91%)	30.7%

Years	Total emission reductions – registered PDD (tonnes of CO ₂ e)	Total emission reductions – revised PDD (tonnes of CO ₂ e)	Difference
2008 (Mar - Dec)	36 400 /	24 724 ¹	-32.1%
2009	43 680	46 855 ²	7.3%
2010	43 680	54 201	24.1%
2011	43 680	54 201	24.1%
2012	43 680	54 201	24.1%
2013	43 680	54 201	24.1%
2014	43 680	54 201	24.1%
2015 (Jan-Feb)	7 280	9 034	24.1%
Total (tonnes of CO ₂)	305 759	351 617	15.0%
Annual Average of total emission reduction	43 680	50 231	-

Since the date of registration, the production level of each slaughterhouse has gone up and is expected to remain at the new levels in a foreseeable future.

- **Reference regulatory documents**

- CDM Validation and Verification Standard (VVS) ver. 5.0, para 269 - 282*
- Project Standard (PS) 5.0, para 224 - 228*
- Project Cycle Procedure (PCP) 5.0, para 130 -140*
- Methodology: AMS-III.I. ver. 4, para 1*

- **Questions:**

1. Does this case require prior approval or can it be submitted along with the issuance request? Why? (PS 5.0, para 6)
2. What document should be submitted to the DOE to support/evidence the changes described in the revised PDD.

End