

First Validator Assessment Report

Revision to ACM0008 to Include Pre-Drainage of Methane from an Active Open Cast Mine as a Methane Emission Reduction Activity

Voluntary Carbon Standard 2007.1

March 2009

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1. Introduction

This assessment report is provided to Blue Source as a deliverable of the Voluntary Carbon Standard 2007.1 (VCS 2007.1) Double Approval Process. This report covers the assessment of the request for revisions to the UNFCCC-approved consolidated methodology ACM0008 methodology (Version 5) - *Consolidated methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive) and heat and/or destruction through flaring or flameless oxidation.*

2. Methodology Revision Description

ACM0008 methodology (Version 5) "*Consolidated methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive) and heat and/or destruction through flaring or flameless oxidation*" applies to project activities that involve the use of any of the following extraction activities:

- surface drainage wells to capture CBM associated with mining activities;
- underground boreholes in the mine to capture pre-mining CMM;
- surface goaf wells, underground boreholes, gas drainage galleries or other goaf gas capture techniques, including gas from sealed areas, to capture post mining CMM; and
- ventilation air methane that would normally be vented.

The methodology does not apply to open cast mines.

In the request for revision, it is proposed to expand the applicability of ACM0008 to include pre-drainage of methane from an active open cast mine as a methane emission reduction activity.

3. Objectives

The purpose of this first validator assessment report was, through review of appropriate documentation, to assess whether:

- the methodology revision's applicability criteria are appropriate and adequate;
- the approach for determining the project baseline is appropriate and adequate;
- the approach/tools for determining whether the project is additional are appropriate and adequate;
- an appropriate and adequate approach is provided for the definition of the project's physical boundary and sources and types of gases included;
- an appropriate and adequate approach is provided for calculating baseline emissions, project emissions, and emission reductions;
- the approach for calculating leakage is appropriate and adequate;
- the monitoring approach is appropriate and adequate;
- monitored and not monitored data and parameters used in emissions calculations are appropriate and adequate; and

- the methodology revision adheres to the project-level principles of the VCS Program (see Section 3.1.1)

Of the above, the only elements affected by the proposed methodology revisions were the applicability criteria and emissions calculations, which are discussed in more detail in Section 6.

4. Validation Scope

The assessment scope is the independent and objective review of the methodology revision discussed above. The Validation Team was provided the methodology revision document in February 2009. Based on this documentation, a document review took place which resulted in Corrective Action Requests (CARs) and modifications to the proposed methodology revision document. The final methodology revision document, dated March 30, 2009, serves as the basis of the final conclusions presented herewith. The methodology revision document highlighting the proposed changes to ACM008 is included as Attachment A.

5. Overview of the Validation Process

The following validation process was used:

- conflict of interest review;
- selection of audit team;
- initial interaction with the Blue Source contact;
- review and evaluation of the methodology revision document;
- follow-up interaction with the Blue Source contact for supplemental information; and
- final statement and assessment report development.

The validation process was utilized to evaluate whether the methodology revision is acceptable.

Conflict of Interest Review

Prior to beginning any validation project, First Environment, Inc. (First Environment) conducts an evaluation to identify any potential conflicts of interest associated with the project. No potential conflicts were found for this Project.

Audit Team

First Environment's audit team consisted of the following individuals who were selected based on their validation experience, as well as familiarity with coal mine operations.

B. Tod Delaney, Ph.D., P.E., BCEE - Lead Auditor
Greg Kozak – Auditor

Audit Kick-off

The validation process was initiated with an exchange of emails and phone calls between First Environment and the primary Blue Source contact, Mahesh Gundappa (Vice President,

Engineering). The communication focused on confirming the scope and schedule and the information required for the first validation.

Corrective Actions and Supplemental Information

The team requested clarification and supplemental information as well as three corrective actions during the validation. The corrective action requests and the responses provided are summarized in Section 6.

Validation Reporting

Validation reporting, represented by this first validator assessment report for Blue Source, documents the validation process and identifies its findings and results.

6. Validation Results

The validation process focused on assessing the appropriateness and adequacy of the methodology revision's applicability criteria, baseline approach, additionality, project boundary, emissions, leakage, monitoring, data and parameters, and adherence to the project-level principles of the VCS Program. Only those elements affected by the methodology revisions are discussed below:

Applicability Criteria - Assessment of whether the methodology's applicability criteria are appropriate and adequate.

ACM0008 does not apply to open cast mines. In the request for revision, it is proposed to expand the applicability of ACM0008 to include pre-drainage of methane from an active open cast mine as a methane emission reduction activity.

The pre-drainage of methane at open cast mines is identical to those activities used to pre-drain methane from underground coal mines. Additionally, ACM0008 methodology was not originally focused on open cast surface mines as it was developed for underground mines predominantly for projects in operation in China. Further, pre-drainage of methane from an active open cast mine involves the capture of CBM that would otherwise be released to the atmosphere, which is similar to the specification in ACM008. The proposed redline changes in the ACM008 revision document reflect the use of ACM008 for open cast surface mines.

Based on the above information and resolution to CARs, the methodology revision's applicability criteria are appropriate and adequate.

Emissions - Assessment of whether an appropriate and adequate approach is provided for calculating baseline emissions, project emissions and emission reductions.

According to ACM0008, credit for methane capture can be claimed once the well has been intersected by coal mining or its zone of influence overlaps with mining. In the request for revision, it is proposed that the mining operations have entered the zone of influence of a CBM well when that well begins to produce atmospheric gases (oxygen and/or elevated amounts of nitrogen). The area of overlap will be considered to be 100 percent when mining operations require that a CBM well be shut in or abandoned due to low gas quality or, in the case of an open cast mine, overburden stripping operations require the well to be abandoned. Because of

the shallow depths and high coal permeability, the pre-drainage wells communicate with the mine face much sooner than deep underground coal seams. In open cast mines the “zone of influence” is identified by infiltration of air across the mine face that results in a significant drop in well methane concentrations leading to well closure, which is similar to a CBM well being mined through.

Based on the above information and resolution to CARs, the methodology revision’s approach for calculating baseline emissions, project emissions, and emission reductions is appropriate and adequate.

Corrective Actions and Requests for Clarification

Where First Environment identified issues that needed clarification or represented key elements of the methodology revision that may prevent it from being successfully validated under the VCS 2007.1 protocol, a corrective action or clarification request was issued. First Environment requested corrective actions and requests for clarification that were resolved as follows by Blue Source:

Correct Action Request and Requests for Clarification	Participant Response	Validation Conclusion
<p>Provide justification for the inclusion of open cast mine activities</p>	<p>The ACM0008 methodology was not focused on open cast surface mines as it was originally developed for underground mines predominantly for projects in operation in China. With the proposed revisions, the methodology can be applied to open cast mines found in the U.S. and other countries. The pre-drainage of methane at opencast mines is identical to those activities used to pre-drain methane from underground coal mines. The “zone of influence” is identified by infiltration of air across the mine face that results in a significant drop in well methane concentrations leading to well closure, which is similar to a CBM well being mined through. The pre-drainage of methane at opencast mines involves the capture of CMM that would otherwise be released to the atmosphere, which is similar to the specification in ACM0008.</p>	<p>Response to CAR is acceptable</p>
<p>According to ACM0008, credit for methane capture can be claimed once the well has been intersected by coal mining, or its zone of influence overlaps with mining. This would require determining each well’s zone of influence and area of overlap.</p> <p>It is proposed that credit for methane capture can be claimed once a well has been suspended or abandoned because of the ingress of atmospheric gases or surface mining activities. Provide justification for this revision.</p>	<p>Because of the shallow depths and high coal permeability, the pre-drainage wells communicate with the mine face much sooner than deep underground coal seams. Evidence has shown that the gas from wells located within approximately 2,000 feet of a mine face contain up to 60-70 percent air. Because of this, the revision considers those wells’ zone of influence to overlap with mining and to be in full communication with the mine face before it’s actually mined through.</p>	<p>Response to CAR is acceptable</p>

Correct Action Request and Requests for Clarification	Participant Response	Validation Conclusion
Ensure that changes made to parameters in the text of the methodology are reflected in the monitoring section.	The methodology revision document was modified to ensure consistency between changes made to parameters in the text of the methodology and monitoring section.	Response to CAR is acceptable

7. Validation Conclusion

First Environment has performed a validation (first validator assessment) of the request for revisions to the UNFCCC-approved consolidated methodology ACM0008 methodology (Version 5).

It is our opinion that the request for revision to ACM0008 be approved.

By collecting CMM otherwise vented to the atmosphere, the pre-drainage of methane from an active open cast mine results in reductions of greenhouse gas emissions that are real, measurable, and give long-term benefits to the mitigation of climate change.

The validation is based on the information made available to us and the engagement conditions detailed in this report. The only purpose of this report is its use in determining whether the request for revisions to the UNFCCC-approved consolidated methodology ACM0008 methodology (Version 5) is acceptable. Hence, First Environment cannot be held liable by any party for decisions made or not made based on the validation opinion, which will go beyond that purpose.

9. Validator Signatures



B. Tod Delaney, Ph.D., P.E., BCEE

ATTACHMENT A



Revisions to ACM0008 to Include Pre-drainage of Methane from an Active
Open Cast Mine as a Methane Emission Reduction Activity

March 30, 2009

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Introduction

This document specifies revisions to the UNFCCC-approved consolidated methodology ACM0008 Version 5 “Consolidated methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive) and heat and/or destruction through flaring or flameless oxidation”

The purpose of this document is to specify where in ACM0008 revisions need to be made and provides recommended revisions that would allow the recognition of the pre-drainage of methane that would have been emitted from an open cast mining operation. The numbering and headings follow ACM0008.

I. SOURCE, DEFINITIONS AND APPLICABILITY (page 1)

Definitions (page 1)

Recommended Revision: Add the following definition

Open cast mine face. That area of an open cast (surface excavation mine) coal mine that has been exposed to the atmosphere through the removal of overburden and coal.

Applicability (page 2)

Recommended Revision:

The methodology **does not apply** to project activities with any of the following features:

- Capture methane from abandoned/decommissioned coalmines;
- Capture/use of virgin coal bed methane, e.g. methane of high quality extracted from coal seams independently of any mining activities;
- Use CO₂ or any other fluid/gas to enhance CBM drainage before mining takes place.

II. BASELINE METHODOLOGY PROCEDURE (page 3)

Identification of the baseline scenario (page 5)

Step 1: Identify technically feasible options for capturing and/or using CBM or CMM or VAM (page 5)

Recommended Revision:

Step 1a: Options for CBM and CMM or VAM extraction (page 5)

The baseline scenario alternatives should include all possible options that are technically feasible to handle CBM and CMM or VAM to comply with safety regulations. These options could include:

- A. Pre mining CMM extraction including **CBM to open cast mine face drainage**, CBM to Goaf drainage and/or Indirect CBM to Goaf only;
- B. Post mining CMM extraction;
- C. Possible combinations of options A, B and C with the relative shares of gas specified. These options should include the CDM project activity not implemented as a CDM project.

Baseline Emissions (page 13)

Methane destruction in the baseline (page 14)

Recommended Revision:

Depending on the nature of the activities in the baseline scenario, CBM/CMM can be removed at **five** different stages – (1) as coal bed methane from a CBM to goaf wells prior to mining, or from underground pre-mining CMM drainage; (2) during the mining process using surface or underground post

mining CMM drainage techniques, (3) during the mining process using ventilation air or (4) after the mining process by drainage from sealed goafs but before the mine is closed or (5) as coal bed methane from a CBM to open cast mine face.

Eligible CBM (page 19)

The approach to quantify the eligible CBM is to identify the zone of influence of CBM wells, and when these are impacted by mining activities.

Step 1: Identify relevant wells (page 19)

Step 2: Estimation of the Zone of Influence of a CBM Well and eligible methane (page 20)

Area of Overlap (page 21)

Recommended Revision:

This methodology estimates the overlap between a cylindrical gas drainage zone around a production well with the zone of disturbance around (1) a longwall panel, from which gas is emitted into the mine or (2) an open cast mine face from which gas is emitted to the atmosphere.

There are two approaches to calculate the zone of influence of a CBM well. One is the existing method to calculate the zone of influence of a CBM well (1 above). The second builds upon approach 1 and is described below.

Use the current approach in ACM0008 until the well produces elevated amounts of atmospheric gases (usually nitrogen concentrations that are at least 5 percent above baseline levels). Standard well operating procedures ensure that the elevated amounts of atmospheric gases are not due to leakage around the well bores.

The mining operation has entered the zone of influence of a CBM well when that well begins to produce atmospheric gases (as defined above). A calculated area of overlap may also be used to determine when and to what extent mining operations intersect the zone of influence of a CBM well. This will be dependent upon site specific parameters that are used to determine the overlap based on current ACM0008 methods. The area of overlap will be considered to be 100% when mining operations require that a CBM well be shut in (closed) or abandoned, or, in the case of an open cast mine, overburden stripping operations require the well to be abandoned.

Recommended Revision:

Once the zone of influence for a well in a given year overlaps the longwall panel or the open cast mine face to be mined, then the gas from the well is considered to be eligible CBM. To estimate portion of CBM that would have been released from mining activities, a geometric approach in the horizontal plane and the vertical plane is used where the area of overlap between the defined zones of influence for each well and the longwall panel or the opencast mine face to be mined (“Area of Overlap”) is used as well as the de-stressing zone above and below the seam to be mined.

Horizontal plane: The ratio of the Area of Overlap to the total area of the zones of influence of the wells considered is calculated and used to identify the appropriate share of gas counted as eligible CBM. The equations for this are:

$$ES_h = \frac{\sum_w AO_w}{\sum_w AT_w}$$

EQ 20

Where:

- ES_h = Eligible share of CBM based on the horizontal plane overlap (%)
 AO_w = Area of overlap of well w with the longwall mining panel or open cast mine face (m²)
 AT_w = Total zone of influence of well w (m²)
 w = CBM wells with zones of influence that overlap with mining activity

Note that for CBM wells which will be physically intersected by mining or have been suspended or abandoned because of the ingress of atmospheric gases from the mine face, ultimately makes it unsuitable for the specific project, or surface mining activities (e.g., excavation of overburden, drilling and blasting, mining of the coal), ES_h is unity by definition. In other words, all of the CBM drained from this type of well is eligible, unless there is gas coming from seams beyond the de-stressing zone.

Recommended Revision:

Vertical plane:

- A. For an underground mine, the de-stressing zone typically extends upwards 140 m and downwards 40 metres. If cased boreholes are used and the seams are fractured within the de-stressing zone, then all the gas entering the CBM well is gas that would have appeared as methane in ventilation air and CMM during and after mining. If other seams outside of the de-stressed zone are fractured, then this gas must be excluded from the eligible CBM.
- B. For an open cast mine the de-stressing zone includes all strata above the mined coal seam and up to 40 meters below the mined seam. If cased boreholes are used and the seams are fractured within the de-stressing zone, then all the gas entering the CBM well is gas that would have been emitted as methane at the open cast mine face. If other seams outside of the de-stressed zone are fractured, then this gas must be excluded from the eligible CBM.

The eligible share is defined as follows:

$$ES_{tv} = t / T$$

Where:

- $_{v}ES$ = Eligible share of CBM based on the vertical plane overlap (%)
 t = Thickness of coal which lies within the longwall or open cast mine face emission zone (m)
 T = Total thickness of coal that is producing gas in the production well (m)

CO₂ emissions from use or destruction of CBM (page 22)

Recommended Revision:

Note that while only the eligible CBM should be accounted to calculate the volume of methane emissions avoided by the project, the totality of the CO₂ resulting from the use or the destruction of all the CBM extracted should be accounted as project emissions. Note that once a CBM well has been mined through underground, then the well acts in the same manner as conventional underground post mining CMM drainage (surface goaf well) and therefore all of the methane that is drained through this type of well is eligible, irrespective of whether the well is drilled offcentre to the longwall panel and some of the area of influence is outside the area of the longwall panel.

CBM drainage from outside the de-stressed zone (page 29)

Recommended Revision:

Surface CBM drainage wells can in some cases drain gas from seams that are outside the de-stressed zone for 140m specified in this methodology, or could extract from an area larger than the circular zone of influence used in this methodology. The vertical leakage would only occur if the surface wells were not cased. Similarly, if there is surface CBM extraction in the baseline, then the gas drawn from other seams would be the same in the baseline and project scenario. Therefore, in cases where:

- (1) Surface boreholes drilled in the project activity are not cased;
- (2) There are no surface boreholes for CBM draining present in the baseline scenario. Project participants should discount the total emissions reductions achieved. The amount of discount should be based on:

Option 1: A comparison of *ex ante* engineering estimates of CBM production from surface boreholes versus actual project activity CBM production;

Option 2: A standard discount factor of 10%

III. MONITORING METHODOLOGY (page 34)

Recommended Revision: (page 34)

All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data should be monitored if not indicated otherwise in the tables below. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

Recommended Revision: (page 46)

Data / parameter	t
Data unit	m
Description	Total thickness of coal in longwall or open cast mine face emission zone
Source of data	
Measurement procedures (if any)	
Monitoring Frequency	At start of each crediting period
QA/QC procedures	
Any comment	From geology report and drilling records

Recommended Revision: (page 47)

Data / parameter	AO _w
Data unit	m ²
Description	Area of overlap with longwall panel or open cast mine face
Source of data	
Measurement procedures (if any)	
Monitoring Frequency	Annually
QA/QC procedures	
Any comment	