

Intent to Develop Alberta offset system

Quantification Protocol: Coal Mine Ventilation Air Methane Project Protocol

Please contact Climate Change Central with any questions or clarification of requirements at contact@climatechangecentral.com.

This Intent to Develop an Alberta offset system Quantification Protocol document is intended to provide Alberta Environment with an overview of the proposed protocol idea to demonstrate how this protocol will meet the requirements of the Alberta offset system. The protocol developer is required to present this information to Alberta Environment and must receive approval in concept for the protocol before the protocol idea will be considered for development in the Alberta offset system.

Familiarity with and general knowledge of the Alberta offset system is required prior to initiating a protocol. Information on the Alberta offset system is available on the Carbon Offset Solution website (<http://carbonoffsetsolutions.climatechangecentral.com>) and on the Alberta Environment website (<http://environment.alberta.ca/02275.html>).

Alberta Environment will review the submitted information in order to assess and provide feedback on the following elements:

- How the proposed protocol meets the eligibility criteria in Section 7 of the Specified Gas Emitters Regulation;
- Applicability of the proposed protocol against purpose and intent of the Alberta Offset System;
- Baseline adoption levels and credit potential for Alberta;
- Baseline, project condition, and key assumptions for the proposed protocol;
- Key stakeholders and technical experts in the field; and
- Relevant science and technical information

General Description of the Proposed Protocol¹ [Provide a written overview on the intent, purpose and relevant background information on the protocol.]

Background: mine ventilation systems

Methane is formed during the same geologic process that converts vegetative matter to coal; coal mining and post-mining processes release this methane from the coal and surrounding rock strata to the atmosphere.

When combined with air in concentrations of 5 to 15 percent, methane released by methane activity is explosive within the mine atmosphere. All underground coal mines in Canada and the United States are required to establish and maintain ventilation systems. The primary purpose of ventilation systems is to

¹ **Some important notes to consider:**

- *Protocols should be based on best available science.*
- *Follow the ISO 14064:2 standard processes – specifically addressing principles of conservativeness, completeness, relevant, consistent with others, accuracy and be completely transparent in development and descriptive processes.*
- *Be very clear with respect to the Measurement, Monitoring and Verification requirements to allow little interpretation.*

(1) dilute the methane in the mine air and (2) remove the methane from the mine. Clean intake air is drawn in into the mine from above ground through intake air shafts, where it is channeled through the intake airways to the face, and then through the “returns” to a return air shaft(s). The energy needed to move the large quantities of air through the ventilation system is provided by high-powered exhaust mine fans located on the surface at the return air shaft(s). Upon passing up the return air shaft(s) and through the fan, the mine air, including diluted methane, is vented to the atmosphere.

The ventilation systems emit highly dilute concentrations of methane; typically the mine air vented from return air shafts is less than one (1) percent methane. Coal mine ventilation air methane is typically referred to as VAM.

Overview of intent and purpose

The Protocol will apply to VAM destruction projects implemented at Alberta underground coal mine ventilation shafts. Project developers will use this Protocol to register greenhouse gas reductions with the Alberta offset system. The Protocol will provide eligibility rules, methods to calculate reductions, as well as monitoring and reporting instructions.

Intent [Describe the protocol activity and reduction opportunity.]

The activity is the destruction of methane emitted by Alberta underground coal mine ventilation systems. The reduction potential associated with this activity has been evaluated at 300,000 tCO_{2e}/year in Alberta. This is the estimated potential at the Grande Cache Coal underground coal mine.

Project Condition [Explain the project condition, activity creating the emission reduction or removal, other relevant information. Please include sample calculations if available. If unavailable, effort should be made to provide a high level technical assessment to of the reduction opportunity being claimed.]

For the purpose of this Protocol, a Greenhouse gas (GHG) reduction project is defined as the installation and operation of any device, or set of devices, that result in the destruction of VAM that would otherwise have been vented to the atmosphere from an underground coal mine.

VAM projects may include, but are not limited to, the following technologies:

- Thermal flow reversal reactors with or without catalysts.

Note on VAM destruction technology and projects

Biothermica has developed, financed and implemented the first VAM project at an active mine in America. Based on the company’s Regenerative Thermal Oxidation (RTO) VAMOX® technology, the project has been fully operational since March 2009 at a Walter Energy mine in Alabama, USA. Registered with the Californian Climate Action Reserve (CAR) standard, this demonstration project has generated close to 55,000 tCO_{2e} of emission reductions for the first two years of operation. The project is characterized by an availability rate of above 90% since March 2009. Based on the success of this project, Biothermica and Walter Energy recently announced an agreement to implement VAM destruction projects at all of Walter Energy’s suitable ventilation shafts. A first full-scale VAM project is scheduled to be operational by the beginning of 2012, generating 330,000 tCO_{2e}/year. Biothermica’s VAMOX® technology was inspired by the company’s proprietary BIOTOX® RTO technology applied to industrial air pollution control since 1990.

VAM destruction projects are also currently in operation in Australia (one project) and China (two projects), based on MEGTEC’s RTO Vocsidizer system. The Australian project is registered under the New South Wales’ carbon standard, while the two (2) Chinese projects are registered under the Clean

Development Mechanism (CDM) standard.

Two (2) additional VAM destruction carbon projects are under development in the United States. It has been publicly announced that one of these projects will be based on RTO technology developed by the European manufacturer Dürr. The two (2) projects are expected to generate respectively 190,000 tCO₂e/year and 350,000 tCO₂e/year.

Related Protocols and/or Methodologies [Do other jurisdictions, programs or offset systems have similar or related protocols available, and if so, discuss similarities and differences between the proposed protocol idea for Alberta relative to other jurisdictions. Please also indicate knowledge gaps and areas where more research is needed or being undertaken to further support the proposed activity]

The following protocols and methodologies have been developed under the Clean Development Mechanism (CDM) and the Climate Action Reserve (CAR) standard:

- ACM0008 v7, *Consolidated methodology for coal bed methane, coal mine methane, and ventilation air methane capture and use for power and heat and/or destruction through flaring or flameless oxidation*
- CAR Coal Mine Methane (CMM) Project Protocol v1

The Alberta VAM Protocol will draw essentially from the CAR CMM Protocol, Biothermica having notably participated in the expert working group dedicated to its development. The CAR Protocol applies to VAM destruction and also the destruction of drained CMM through flaring or power generation. The Protocol developed for Alberta will focus on VAM destruction projects only as there are no drainage activities at active underground mines in Alberta.

Note: the CAR Protocol draws heavily on ACM0008 v7 with regard to emission reduction calculations

Baseline [Explain the project baseline condition, adoption levels for the province, business as usual activity, general baseline assumptions, credit potential in Alberta, other relevant information.]

There currently is no regulatory obligation in Alberta with regard to the destruction of coal mine VAM. The business as usual activity is therefore the release of the VAM to the atmosphere. The baseline condition is the release of vented VAM to the atmosphere.

The credit potential in Alberta has been estimated at 300,000 tCO₂e/year. This is the estimated potential at the Grande Cache Coal underground coal mine.

Relevant project emissions [state which greenhouse gases will be affected by this project; direct and indirect emissions including positive and negative affects]

Specified Gas	Formula	100-year GWP	Applicable to Project
Carbon Dioxide	CO ₂	1	Y
Methane	CH ₄	21	Y
Nitrous Oxide	N ₂ O	310	N
Sulphur Hexafluoride	SF ₆	23,900	N
Perfluorocarbons*	PFCs	Variable	N
Hydrofluorocarbons*	HFCs	Variable	N

Baseline emissions: Methane sent to the oxidation unit (CH₄)

Project emissions:

- ○ Emissions from methane destroyed (CO₂)
- ○ Emissions from un-combusted methane (CH₄)
- ○ Emissions from energy consumption (CO₂)

Applicability [Who is the intended user(s) for this protocol?]

The intended user(s) for this protocol are primarily project developers wishing to generate carbon credits based on the destruction of coal mine VAM emitted by Alberta underground coal mines. Project developers can for example be private entities with expertise in VAM carbon project development and implementation. Other entities involved in the VAM project, such as the coal mines and engineering consultants, can also be users of the Protocol.

The Protocol does not apply to surface mines and abandoned mines.

Regulatory Requirements [Describe all relevant regulations that apply to this activity and explain how the activity is going beyond regulatory requirements.]

There currently is no regulatory obligation in Alberta with regard to the destruction of coal mine VAM. The business as usual activity is therefore the release of the VAM to the atmosphere. The baseline condition is the release of vented VAM to the atmosphere.

VAM destruction goes beyond regulatory requirements as there is no regulatory obligation to destroy VAM.

Additionality

VAM destruction is not required by law, regulation or directive. The alternative to the project activity is the business as usual activity, namely venting the VAM to the atmosphere. Sector level adoption for VAM destruction in Alberta is inexistent as of 2011. VAM destruction is therefore 100% additional.

Barriers

Carbon credit revenues are the main incentive for the development of VAM projects, considering there is no regulatory incentive to destroy VAM. The offset protocol is therefore necessary for the development of such projects in Alberta.

Specific constraints also create barriers to the generation of energy:

- Low concentration of methane in VAM (low energy content);
- Remote location of ventilation shafts (distance from potential energy demand);
- Life duration of certain ventilation shafts (5 years or less): VAM oxidation systems have to be relocated, thereby leading to prohibitive costs for power generation equipment.

VAM projects are therefore dependent on carbon revenues considering the absence of regulatory obligations and barriers to the generation of energy.

Permanence [Are emission reductions and/or removals reversible. If so, how does the protocol developer propose to address permanence of offset credits associated with this activity?]

Emission reductions from VAM destruction projects are not reversible, methane destruction is permanent.

Leakage [Will this protocol result in or threaten leakage of greenhouse gas emissions, and if so, how will these risks be mitigated? Include a discussion on possible scenarios that may occur.]

This Protocol will not result in leakage. VAM destruction equipment is independent of the mine's systems and does not affect mine operations.

Conservativeness [How does the proposed protocol idea address conservativeness in emission reduction quantifications?]

Conservativeness and accuracy is ensured by the continuous monitoring of key parameters. Monitoring requirements include:

- Total inlet flow entering the reaction chamber, measured continuously and recorded every two minutes;
- Temperature and pressure of the inlet flow and exhaust gas from the oxidation unit, measured continuously and recorded every hour;
- The fraction of methane in the VAM entering the oxidation unit and in the exhaust gas, measured continuously and recorded every two minutes.

In addition, monitoring instruments shall be inspected, cleaned and calibrated according to the following schedule:

- Cleaned and inspected on a quarterly basis, with the activities performed and as found/as left condition of equipment documented;
- Field checked for calibration accuracy with the percent drift documented, using either a portable instrument (such as a pitot tube) or manufacturer specified guidance at the end of – but no more than two months prior to – the end date of the reporting period;
- Calibrated by the manufacturer or a certified calibration service per manufacturer's guidance or every 5 years, whichever is more frequent.

A conservative data substitution methodology shall also be developed in accordance with existing practices within the Alberta offset system. The CAR Protocol also provides detailed instructions for data substitution and constitutes a good starting point.

Aggregation [Is this protocol likely to result in aggregated projects? If so, are there risks associated with aggregated projects, and how does the protocol propose to handle these risks?]

The protocol is not likely to result in aggregated projects

Verification [What types of records are available to support implementation and verification of the proposed activity or project?]

For purposes of independent verification and historical documentation, project developers are required to keep all information outlined in the Protocol. System information the project developer should retain includes:

- All data inputs for the calculation of GHG reductions including all required sampled data;
- Copies of permits for activities and equipment related to the VAM project;
- Methane flow meter information;
- Field checks and calibration results for all meters;
- Corrective measures taken if meter does not meet performance specifications;
- Calculations that determined emissions reductions;
- Verification records and results from each verification.

Ownership [Identify issues around ownership chain that pertain to this activity or project.]

Initial ownership of the VAM must be determined, as well as the transferability of the methane rights to the project developer. With regard to Coal Bed Methane (CBM) gas operations in Alberta, the rights to explore and develop CBM are granted under conventional petroleum and natural gas leases and the Coal Bed Gas Act. It remains to be determined whether VAM falls under the jurisdiction of Alberta's Coal Bed Gas Act. A legal opinion in that regard might be necessary.

Government of Alberta – Energy :

<http://www.energy.alberta.ca/NaturalGas/753.asp>

Global Methane Initiative, Summary of Coal Industry in Canada:

<http://www.globalmethane.org/partners/canada.aspx>

Other Benefits [List all associated benefits that will result from this activity. These other benefits can include environmental benefits, economic benefits, etc.]

The adoption of this Protocol will support the development the first VAM destruction project in Canada, leading to the following additional benefits:

- Reduction of greenhouse gas emissions;
- Enhanced mine security through the continuous monitoring of the VAM concentration at the inlet of the oxidation unit;
- Enhanced environmental image for Alberta's coal industry and the Province of Alberta;
- Investments in the Province of Alberta with regard to construction and operation activities.

Adverse Effects [List any adverse effects that may result from implementing this activity or project.]

No adverse effects

Proposed Timing for Submission into the Offset System Review Process [Please

identify the anticipated submission date for this protocol to be considered for stakeholder review. Note: the stakeholder review is held once per year in the fall.]

anticipates to have the Protocol ready for the fall submission