Chicago Climate Exchange®

Coal Mine Methane Collection and Combustion Offset Project Protocol

Coal Mine Methane Collection and Combustion Offset Projects

The Chicago Climate Exchange (CCX®) Coal Mine Methane Offset Project Protocol outlines the process and requirements for Project Proponents to register greenhouse gas emission reductions resulting from the voluntary destruction of methane originating from coal mines. The CCX General Offsets Program Provisions, the CCX Offset Project Verification Guidance and the CCX Offset Project Protocols can be downloaded by visiting www.theccx.com. Requests for further information or comments may be directed to offsets@theccx.com.

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CHICAGO CLIMATE EXCHANGE OFFSET PROJECT PROTOCOL

Coal Mine Methane Collection & Combustion Offset Projects

Updated as of 8/20/2009

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ACRONYMS, TERMS AND DEFINITIONS[1]

ANSI	American National Standards Institute
CCX	Chicago Climate Exchange
IPCC	Intergovernmental Panel on Climate Change
WBCSD	World Business Council on Sustainable Development
WRI	World Resources Institute

Abandoned Mine Methane (AMM): Methane that is produced from coal mines designated as abandoned according to U. S. Mine Safety and Health Administration (MSHA) or equivalent non-U.S. mining regulatory agency rules.

Coal Mine Methane (CMM): As part of the mining process, methane contained in the coal and surrounding strata may be released. This methane is referred to as coal mine methane since its liberation is a result of mining activity. In some instances, methane that continues to be released from the coal-bearing strata once a mine is closed and sealed may also be referred to as coal mine methane (or abandoned mine methane) because the liberated methane is associated with past coal mining activity.

Coalbed Methane (CBM): Methane that resides within or is produced from coal seams. For the purposes of this Protocol, coalbed methane refers to methane produced from coal seams unrelated to mining activities.

Gob: A fractured rubble zone behind the mining face that is caused by the removal of the coal and the subsequent collapse of the mine roof and heaving of the mine floor.

Mine Gas: The drainage gas released during or after mining that contains coal mine methane but also contains various levels of other components, such as nitrogen, oxygen, carbon dioxide, hydrogen sulfide, and heavier hydrocarbons.

Mine Safety and Health Federal enforcement agency responsible for the health and safety of U.S. miners.

[1] Please refer to CCX General Offsets Program Provisions for additional "Acronyms, Terms and Definitions"

Administration (MSHA):	
Non-Methane Hydrocarbons (NMHC):	Hydrocarbon air pollutants, except methane, which are considered significant precursors to ozone formation.
Post-mining Drainage:	Coal mine methane extraction after completion of the mining process from vertical surface gob wells, underground inclined or horizontal boreholes, gas drainage galleries, or other gob gas capture techniques, including drainage of sealed areas in the mine (for safety reasons).
Pre-mining Drainage:	Coal mine methane extraction from vertical surface wells (CBM) or horizontal underground boreholes in the mine prior to mining activities.
Ventilation Air Methane (VAM):	Coal mine methane that is mixed with the ventilation air in the mine that is circulated in sufficient quantity to dilute the methane to low concentrations (typically below 1 percent) for safety reasons.

1. INTRODUCTION

Chicago Climate Exchange (CCX) is the world's first and North America's only active voluntary, legally binding integrated trading system to reduce emissions of all six major greenhouse gases (GHGs), with Offset Projects worldwide. CCX Members with significant GHG emissions voluntarily enter into a binding agreement to reach CCX GHG emission reduction goals. Exchange Allowances are generated from Members that reduce their emissions beyond their annual reduction commitments whereas Offsets are generated by registering CCX Offset Projects. The CCX Coal Mine Methane (CMM) Collection and Combustion Offset Project Guidelines outlines the process and requirements for Project Proponents to register GHG emission reductions resulting from the voluntary destruction of methane originating from coal mines. Registered and verified CMM Capture and Destruction Offset Projects will be credited with Offsets.

CCX strives to promote transparency and integrity in the carbon market. In accordance with this goal, CCX, when developing this document, was guided by the fundamental principles of Project GHG accounting outlined in ISO 14064-2: *Specification with guidance at the Project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements*, Version 1. These principles include:

- Relevance
- Completeness
- Consistency
- Accuracy
- Transparency
- Conservativeness

The following sections discuss the Project criteria, boundaries, monitoring requirements, emissions reduction calculations and other guidelines that each Project Proponent must adhere to in order to generate Offsets from Coal Mine Methane Collection and Combustion Offset Projects.

2. GENERAL PROVISIONS

All Offset Project eligibility is subject to the CCX General Offset Program Provisions, the CCX Offset Project Protocol for CMM and Combustion Offset Projects, and the determinations of the CCX Committee on Offsets. Project Proponents should review the CCX General Offset Program Provisions and the CCX Offset Project Protocol for CMM Collection and Combustion Offset Projects.

3. ASSOCIATED DOCUMENTS

This Protocol references the use of several associated documents. These documents include:

- CCX General Offset Program Provisions
- CCX General Verification Guidance Document
- CCX Project Implementation Document
- CCX Project Specific Conflict of Interest Form
- CCX Greenhouse Gas Emission Factors Document
- CCX Project Owner Attestation

These documents are available on the Offsets section of the CCX website: www.theccx.com

4. PROJECT DEFINITION

A CMM Project consists of the capture and utilization or destruction of CMM and Abandoned Mine Methane (AMM) that meets the eligibility criteria and other requirements outlined in these guidelines. The capture and utilization of CMM leads to permanent destruction of methane that would have otherwise been released into the atmosphere. This Protocol applies to methane recovered from active and abandoned coal mines using the following extraction techniques:

1. Pre-mining drainage wells (from the surface or underground) associated with mining activities at active coal mines.
2. Post-mining drainage wells (from the surface or underground) associated with mining activities including from sealed mine areas.

5. ELIGIBILITY CRITERIA

Several factors determine a Project's eligibility for generating Offsets including the Proponent's membership status, ownership status, Project start date, location and whether the Project meets the CCX performance benchmark.

5.1 CCX Membership

The Project Proponent must be a Member or Participant Member (Offset Provider or Aggregator) of CCX. Project Proponents should contact CCX directly for membership rules and information.

For-profit entities, cooperatives, governmental bodies and non-profit organizations may act as CCX Offset Aggregators. An Aggregator serves as an administrative representative, on behalf of Project Owners, of multiple CCX-qualifying Offset Projects. CMM Collection and Combustion Offset Aggregators are responsible for maintaining a database of Project Owner's records.

5.2 Eligibility Governing Entities with Minor Emissions

Entities with an entity-wide emissions profile greater than 10,000 metric tons of carbon dioxide equivalent (Mt CO_2e) for the most recent calendar year may register and trade CCX Offsets only if the entity is a Member of CCX and undertakes the CCX Emission Reduction Commitment. For specific guidance on this provision, Project Proponents should review CCX General Offset Program Provisions.

Entities who are unsure of their emissions profile should estimate their direct CO_2 emission using well accepted methodologies such as those available at the World Resources Institute (WRI)/World Business Council on Sustainable Development (WBCSD). CCX requires that all entities that are not Members, including producers enrolled with Aggregators, provide an attestation relating to their direct emissions in a form provided by CCX.

5.3 Ownership and Control

The Project Proponent must demonstrate clear ownership of the GHG mitigation rights associated with the Project in order to register CMM Collection and Combustion Projects with CCX. Contract documentation may be provided by the Project Proponents to express ownership of the GHG mitigation rights. Where appropriate, an attestation of Project Ownership shall satisfy this requirement

CCX Offset Aggregators must have acquired appropriate control of the GHG mitigation rights from the Project Owner in order to execute its responsibilities on CCX pursuant to CCX General Offset Program Provisions. Aggregators must demonstrate to the Project Verifier and CCX that they have acquired appropriate control.

5.4 Project Start Date

Projects must start on or after January 1, 2003, which corresponds with the beginning of the CCX cap and trade program.

5.5 Project Location

CMM Projects shall be located either in the United States or in a country designated as a non-Annex I country under the Kyoto Protocol. Project Proponents with Projects in non-Annex I countries should submit the CCX Project Implementation Document (PID) to CCX for review.

5.6 CMM Project Characteristics

To be eligible to earn Offsets, any methane-extraction technique used at active coal mines must be approved for use by the Mine Safety and Health Administration (MSHA) or equivalent non-U.S. mining regulatory agency rules for Projects located outside the U.S. In

addition to the requirements stated elsewhere in these guidelines, the following criteria apply to determine methane eligibility:

1. Methane produced before and after mine-through from pre-drainage wells will only be eligible after the well is mined through.
2. All methane produced before and after mine-through from pre-drainage wells from within a -50 meter to +150 meter vertical range of the mined coal seam will become eligible when the well is mined through.
3. Methane produced outside the vertical limit can become eligible if the candidate Project demonstrates sufficient analytical evidence, consistent with the IPCC Tier 3 Methodology[2], which connects methane generated outside the established vertical range to the mined seam in question.
4. All methane produced from qualifying wells at abandoned coal mines will be eligible.
5. Coal bed methane is ineligible.

5.7 Performance Benchmark

CMM Projects are not eligible to generate Offsets in instances where the CMM collection and destruction can be considered a standard business practice (i.e. business as usual) or is required by law or other legally binding framework. CCX has identified two performance criteria that Projects must meet to be considered for Offsets issuance.

5.7.1 Regulatory Criteria

In order to be eligible to receive Offsets under these guidelines, the Project shall not be required to collect and destroy CMM under any federal, state or local regulation or other legally binding framework. The regulatory criteria must be applied to both U.S. and non-U.S.-based Projects (approved Projects originating in non-Annex I Kyoto Protocol countries).

During the course of verification, the Project Proponent shall provide to the Verifier reasonable assurances necessary to prove that the Project is not required under any federal, state or local regulation or other legally binding framework and shall sign an attestation stating that the Project is not required under any federal, state, or local regulation or other legally binding framework.

5.7.2 Common Practice Criteria

According to the GHG Protocol for Project Accounting, "*Common practice refers to the predominant technologies or practices in a given market, as determined by the degree to which those technologies or practices have penetrated the market (defined by a specified geographic area).*"[3]

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[2] Intergovernmental Panel on Climate Change (IPCC), 1996. *Greenhouse Gas Inventory Reference Manual (Revised).* v.3.

[3] World Resources Institute and World Business Council for Sustainable Development. 2005. *The Greenhouse Gas Protocol for Project Accounting.* WRI/WBCSD, Washington, D.C.

CCX reviewed information regarding the prevalence of CMM Projects in the United States. The US EPA Coal bed Methane Outreach Program (CMOP) gathers information on coalmines in the US and their gas management systems. Based on this review, only 2.5% of coalmines recover and use coal mine gas. When excluding non-gassy mines from this population, approximately 10-11% of mines recover and use coal mine gas. The table below provides the summary information.

Table 1 – Summary of Information on Coalmines

Underground Mining	# Coal Mines	% Coal Mines
Mines Employing Methane Use Projects	14[4]	2.5%
Total Underground Mines Producing Coal in 2007	558[5]	

Given the common practice definition above, voluntary gas recovery and destruction at coalmines in the United States is clearly not common practice. Therefore, a Project that meets the regulatory criteria above and installs a GCCS can be considered beyond business as usual. For Projects in non-Annex 1 countries under the Kyoto Protocol, the Project Proponent must similarly demonstrate that the Project activity is beyond business as usual. CCX will periodically review this data to assess whether the performance benchmark has changed and may implement modifications in the future based on the review. Once a Project is registered with CCX, it is not affected by changes to the common practice criteria for the market period in which it registers. The current market period is from January 1, 2003 through December 31, 2010.

6. PROJECT BOUNDARY

A clearly defined boundary is vital to accurately assessing emission reductions due to the installation of a GCCS. Although the destruction method may vary, the Project Boundary for all CMM Projects will include the CMM collection system, equipment used for upgrading the collected gas, monitoring and recording equipment and destruction device(s).

6.1 Identification of GHG Sources, Sinks and Reservoirs

The following table identifies relevant GHG Sources and whether each is to be included within the Project's Boundary.

Table 2 – Relevant GHG Sources to be Included within Project Boundary

[4] Taken from the EPA, CMOP report, "Identifying Opportunities for Methane Recovery at U.S. Coal Mines," http://www.epa.gov/cmop/docs/profiles_2008_final.pdf.
[5] Mine Safety and Health Administration (MSHA) Standardized Information Systems (MSIS)

GHG Source Category	GHG Source	GHG	Included in Project Boundary	Comment[6]
CMM Collection and Upgrading Systems	Emissions resulting from fossil fuel derived energy used by, inter alia, compressors, blowers, and monitoring system	CO_2	Yes	All CO_2 emissions (direct and indirect) due to fossil fuel combustion are required to be included.[7]
		CH_4	No	Excluded, as this emission source is assumed to be very small.
		N_2O	No	Excluded, as this emission source is assumed to be very small.
CMM Gas Destruction Device	Emissions resulting from the destruction of CMM	CO_2	Yes	CO_2 emissions from CMM destruction are included.
		CH_4	Yes	Dependent on efficiency of the destruction device.
		N_2O	No	Excluded, as this emission source is assumed to be very small.
	Emissions resulting from the combustion of fossil fuel in the destruction device	CO_2	Yes	All CO_2 emissions (direct and indirect) due to fossil fuel combustion are required to be included.
		CH_4	No	Excluded, as this emission source is assumed to be very small.
		N_2O	No	Excluded, as this emission source is assumed to be very small.

The GHG Sink(s) will be the destruction device(s) used by the Project. No reservoirs are anticipated in CMM Projects and therefore are not discussed at greater length below.

ISO 14064-2 requires that the Project's GHG Sources and Sinks be categorized as controlled by the Project Proponent, related to the Project, or affected by the Project. These are discussed below.

6.1.1 Controlled GHG Sources and Sinks

Controlled GHG Sources and Sinks for CMM Projects are those that occur on-site. Therefore, Controlled GHG Sources and Sinks for CMM Projects refer to those that are part of the CMM collection and upgrading systems and the CMM gas destruction device.

6.1.2 Related GHG Sources and Sinks

Related GHG Sources and Sinks for CMM Projects refer to those that have material or energy flows into or out of the Project. Therefore, Related GHG Sources and Sinks are the

[6] Based on emissions factors found in Volume 2, Table 2.2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, all CH_4 and N_20 emissions are excluded (with the exception of CH_4 emissions from coal mine destruction), as emissions will be small in comparison to CO_2 emissions.

[7] See Project Emissions discussion in this section for exceptions to the inclusion of indirect emission sources.

electricity grid that supplies electricity to the Project (if applicable) and the natural gas pipeline that conveys upgraded CMM to an end user's destruction device (if applicable).

6.1.3 Affected GHG Sources and Sinks

Affected GHG Sources and Sinks are those that are influenced by the CMM Project and result in new or changed activities outside the Project Boundary that actually increase GHG emissions. This concept is commonly referred to as leakage. CCX does not expect CMM Projects to result in new or changed activities that increase GHG emissions outside of the Project Boundary and, therefore, no Project specific leakage assessment is required.

6.2 Determining the Baseline Scenario

In accordance with the process outlined in ISO 14064-2 possible baseline scenarios were evaluated for CMM Projects. CCX identified two plausible baselines for new CMM Projects:

1. The unmitigated release of methane to the atmosphere.
2. The installation of a voluntary GCCS without the generation of revenue from Offsets.

Based on the information presented in Section 5, the most likely baseline scenario in the absence of regulation or other requirement mandating installation is the unmitigated release of methane to the atmosphere. The GHG Sources, Sinks and Reservoirs identified in this baseline are limited to the GHG emissions from the coal mine.

6.3 Project Emissions

In cases where Project emissions *are not* included in a legally binding emission reduction program (such as an electric utility cap and trade scheme), they shall be included as Project emissions and subtracted from Project emission reductions as provided in Section 8 below. Where Project emissions are included within a legally binding emissions reduction program, they may be omitted from the Project emissions calculation. Only those specific sources included under the capped portion of an emissions reduction program may be omitted. All other sources must be included.

Project emissions sources include, but are not limited to, the use of electricity from the grid, the consumption of purchased steam or heat, and the combustion of fossil fuel by the collection equipment or destruction device. Emissions associated with the preparation of CMM gas for injection to a natural gas pipeline are included within the Project Boundary and shall be counted as a Project emissions source. Since carbon dioxide emissions from these sources are of much greater magnitude than emissions of other GHGs, only carbon dioxide emissions shall be included as Project emissions.

7. MONITORING REQUIREMENTS

The Project Proponent shall develop and maintain a monitoring plan with procedures for obtaining, recording, compiling and analyzing data and information required for quantifying and reporting GHG emission reductions.

CMM Project monitoring includes the following parameters:

- Continuous monitoring of CMM flow, temperature and pressure to each combustion device[8].
- Methane content analysis using a continuous gas analyzer, gas accumulator or a portable gas analyzer.
- Gas sales.
- Gas composition.
- Electricity production.
- Destruction device operating hours.
- Project-related emissions.

Section 8 presents two alternatives for calculating GHG emission reductions for a CMM Project. In the first alternative, CMM flow and methane content data are used while in the second, electricity production data is used to calculate the amount of methane destroyed. Monitoring data shall be maintained to support the calculation to be used by the Project.

7.1 Flow Monitoring

CMM gas flow to all destruction devices, including pumps, blowers, and compression equipment, shall be continuously monitored using an acceptable flow meter. Continuous monitoring is defined as one data point at least every 15 minutes.

7.1.1 Flow Meter Performance Standard

The following information regarding flow-meter performance shall be maintained:

- Manufacturer specifications of flow-meter accuracy should be +/-5% of reading.
- Proof of initial calibration.
- Capability to record flow every 15 minutes.
- Means to correct for temperature and pressure.

7.1.2 Flow Meter Calibration

It is essential that flow meters operate properly in order to accurately quantify GHG emission reductions. To ensure proper flow meter function, annual calibration of the flow meter shall be performed. Flow meter calibrations must meet the following conditions:

[8] Separate monitoring of temperature and pressure is not required when using flow meters that standardize based on temperature and pressure and present flow rate in standard cubic feet per minute (SCFM).

- Calibrations must be performed in accordance with manufacturer's specifications and methodologies.
- Calibrations must be performed by the manufacturer, an ISO 17025 certified calibration and testing organization, or other appropriately trained personnel.
- All records of calibration reports and methodologies must be documented and made available for review during the verification process.

If manufacturer specifications state that the flow meter must be calibrated more often than annually, then the calibration schedule as recommended by the manufacturer shall be followed and the above conditions applied.

7.1.3 *Flow Meter Location*

The flow meter shall be installed at a location that provides a straight section of pipe sufficient to establish laminar gas flow as turbulent flow resulting from bends, obstructions, or constrictions in the pipe can cause interference with flow measurements that rely on differential pressure. Alternatively, a flow meter may be installed where there is not laminar flow, provided the technology is proven to be accurate under such conditions and the location of the installation has been specifically approved by a professional engineer to provide accurate flow meter readings. As discussed previously, flow meters shall be located such that the quantity of CMM being consumed by each destruction device can be continuously and accurately measured.

7.2 Methane Content Analysis

Continuous monitoring of the methane fraction in the CMM gas is preferred. However, for active mine CMM Projects, methane readings may be taken using a portable gas analyzer at least daily due to gas composition being subject to constant variation. If the daily readings demonstrate a variation of less than +/-2 percent over a six-month period, weekly readings will be allowed. For abandoned mine Projects, the methane readings shall occur at least once per month.

7.2.1 Gas Analyzer Performance Standard

The gas analyzer used shall meet the following performance standards:

- Precision: Methane measurements are to be to the nearest 0.1 percent.
- Accuracy: Methane measurement accuracy decreases with increasing methane concentration but should be within +/- 10 percent of reading, as specified by the manufacturer.

Alternate instruments, including gas chromatographs or thermal conductivity detectors shall meet similar standards.

7.2.2 Gas Analyzer Calibration

Continuous gas analyzers shall be calibrated according to manufacturer specifications. Records of these calibrations shall be maintained.

Portable gas analyzers shall be calibrated against a gas sample with a known methane concentration prior to each use. Records of these calibrations shall be maintained according to the Project's monitoring plan and shall be conducted by appropriately trained personnel.

7.2.3 Gas Analyzer Location

A CMM Project may draw from more than one coal mine or different areas of a coal mine with differing methane concentrations. A separate flow meter and methane concentration measurement can be taken from each CMM source before the gas is co-mingled for Project management purposes, but this is not required for documenting methane destruction. The methane concentration of CMM shall be measured before it is combusted by on-site equipment (such as blowers or compressors) and prior to destruction by the end utilization technology.

In Projects where a gas sales meter is required by an agreement with an end user, the data collected may contain a Btu measurement of the gas rather than a direct methane measurement. The Btu analysis may be affected by the presence of non-methane hydrocarbons (NMHCs) in the gas. These data may be used in lieu of methane measurements, but must be adjusted accordingly based on gas analysis showing the NMHC content and a proper adjustment factor. Samples of the sales gas and measurements of the NMHCs should be conducted annually[9]. If the volume of NMHCs in the sales gas is below 1 percent, no adjustment is required for the methane volumes.

7.3 Electricity Production

Where an engine is serving as a destruction device, the following information shall be maintained regarding the measurement of methane combustion:

- Type, make, and model number of combustion unit(s);
- Copy of the summary table from the most recent source test (source test shall be taken within 3 years of inclusion in CCX quantification methodology) showing the measured heat rate of combustion device(s);
- Summary tables showing kWh of electricity produced from CMM per month over the relevant period;
- Type of electrical metering device; and
- Accuracy, precision, and proof of calibration of the electrical metering device per manufacturer specifications (this parameter is only required if the purchasing utility's sales meter is not used as these meters must already meet stringent requirements).

[9] UNFCCC's ACM0008 (Consolidated baseline methodology for CMM/CBM capture and use)

7.4 Destruction Device Operating Hours

The operating hours for each destruction device must be monitored to ensure that methane destruction is claimed for methane used only during periods when the destruction device(s) was operational. Offsets will not be issued for time periods where the destruction device(s) is not operating. Operating hours must be continuously monitored and recorded. In general, operating hours for a flare are tracked through the use of a thermocouple which monitors the presence and temperature of the flame. Operating hours for other destruction devices such as engines should be tracked through operator logs.

Projects shall provide evidence of alarms, valves or other methods (a GCCS often incorporates one or more of these methods so that the system can be shut down when it is not functioning properly) that ensure that the CMM destruction device does not simply vent CMM to the atmosphere. Projects that treat CMM and inject it into a natural gas pipeline shall only provide evidence of the quantity of gas delivered to the pipeline and are not required to provide evidence of CMM destruction.

7.5 Destruction Device Efficiency

CCX reviewed available literature on destruction efficiency values from a variety of sources. Based on this review, CCX determined that 98% default destruction efficiency is conservative and shall be applied where Project Proponents have not conducted source tests or do not have manufacturer data. In situations where a source test has been conducted, the destruction efficiency value obtained during this source test shall be utilized rather than the default destruction efficiency value provided herein.[10]

7.6 Project-Related Emissions

Project-related emissions result from methane destruction and may result from the importation of electricity or from the use of fossil fuels. Information related to electricity usage and relevant fossil fuel consumption may be obtained from sources such as on-site electricity meters, utility invoices, and fuel purchase records. Project emissions may be omitted if the source is included in a legally binding emission reduction program for the period in question.

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[10] Seebold et al., 2003, *Reaction Efficiency of Industrial Flares: The Perspective of the Past.*

[10] The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories gives a standard value for the fraction of carbon oxidized for gas combustion of 99.5% (Reference Manual, Table 1.6, page 1.29). It also gives a value for emissions from processing, transmission and distribution of gas which would be a very conservative estimate for losses in the pipeline and for leakage at the end user (Reference Manual, Table 1.58, page 1.121). These emissions are given as 118,000kgCH4/PJ on the basis of gas consumption, which is 0.6%. Leakage in the residential and commercial sectors is stated to be 0 to 87,000kgCH4/PJ, which equates to 0.4%, and in industrial plants and power station the losses are 0 to 175,000kg/CH4/PJ, which is 0.8%. These leakage estimates are compounded and multiplied. The methane destruction efficiency for landfill gas injected into the natural gas transmission and distribution system can now be calculated as the product of these three efficiency factors, giving a total efficiency of (99.5% * 99.4% * 99.6%) 98.5% for residential and commercial sector users, and (99.5% * 99.4% * 99.2%) 98.1% for industrial plants and power stations.

8. QUANTIFYING GHG EMISSION REDUCTIONS

Emission reductions are assumed to be the amount of methane that would be emitted during the crediting period in the absence of the coalmine methane Project (minus Project emissions).

8.1 Calculations for Metered Methane Destruction

Tabulated records of total daily CMM flows (in standard cubic feet per day) shall be matched with either the continuous methane content data or with the closest possible methane content reading to methane recovery rates, using Equation 1:

Equation 1a: CH_4 Recovered

$$CH_{4recovered} = CMG_{recovered} \times \%CH_4$$

Where:

$CH_{4recovered}$	Methane recovered per day (as measured in standard ft^3/day)
$CMG_{recovered}$	Coal mine gas recovered per day (as measured in standard ft^3/day)
$\%CH_4$	Methane content of CMG

Note: If BTU analyzer data taken at the point of sale is used in lieu of methane measurements and the NMHC volume of the sales gas is above 1 percent, the methane volumes must be adjusted accordingly.

Methane flows shall be tabulated and summed on a monthly basis using the continuous daily readings for flow and the appropriate methane content readings.

Equation 1b: Alternative CH_4 Recovery Method

Energy generation facilities that use CMM as a fuel to generate electricity typically have detailed records of electrical generation rates in kilowatt-hours (kWh) that can be used to calculate methane recovery. Information on the heat rate of the combustion unit in Btu per kilowatt hour (BTU/kWh) can be used to calculate BTUs of methane combusted. The calculation is summarized in Equation 3:

$$\mathbf{CH_{4recovered} = (kWh \times [Btu/kWh]) / 1012}$$

Where:

$CH_{4recovered}$	Total CH_4 recovered (ft^3)
kWh	Total kWh of electricity produced from the CMM
Btu/kWh	Heat rate of electrical generator
1012	HHV of methane (as measured in Btu/ft^3) [11]

To estimate annual methane combustion rates, the Project shall use the amount of electricity generated over a one-year period in the equation above. The heat rate used in the calculation shall be from the most recent source test for the combustion device or the manufacturer specified heat rate.[12]

Equation 2: CH_4 Combusted

In order to estimate the amount of methane combusted in metric tons per year (Mg/yr), the annual methane recovery rate in cubic feet per year needs to be converted to weight using Equation 2:

$$\mathbf{CH_{4combusted} = (CH_{4recovered} \times 16.04 \times [1/10^6] * [1/24.04] \times 28.32) * DE}$$

Where:

$CH_{4combusted}$	Annual methane combusted (as measured in Mg/yr)
$CH_{4recovered}$	Annual methane recovered (as measured in ft^3/yr)
16.04	molecular weight of CH_4
$1/10^6$	Conversion to metric tons (Mg/g)
1/24.04	Gas constant (mol/L – measured at standard temperature and pressure – defined as 68F and 14.7psi)[13]
28.32	Conversion factor (L/cf)

[11] Where the engine heat rate is specified in lower heating value, the Project Proponent shall make the appropriate adjustment.
[12] Source test, if used, shall be taken within 3 years of enrollment in the CCX Offsets program.
[13] The appropriate adjustment factor should be applied if the Project flow meter(s) apply a different standard temperature and/or pressure.

DE	Destruction efficiency of the destruction device (default value of 98%)

8.2 Calculation of Project Emissions

Depending on Project-specific circumstances, certain emissions sources may need to be subtracted from total Project emission reductions using the equations below.

Equation 3a: CO_2 emissions from fossil fuel combustion

$$\mathbf{Dest_{CO2} = \sum_y (FF_y * EF_y)}$$

Where:

$\mathbf{Dest_{CO2}}$	CO_2 emissions from fossil fuel used in methane destruction process (tCO_2)
$\mathbf{FF_y}$	Total quantity of fossil fuel, y, consumed (as measured in volume of fuel)
$\mathbf{EF_y}$	Fuel specific emission factor for fuel, y (as measured in t_{CO2}/fuel quantity - values should be taken from the CCX GHG Emissions Factors online document[14])

Equation 3b: CO_2 emissions from Project specific electricity consumption

$$\mathbf{Elec_{CO2} = (EL_{total} * EF_{EL})/2204.62}$$

Where:

$\mathbf{Elec_{CO2}}$	Project specific electricity emissions (tCO_2)
$\mathbf{EL_{total}}$	Total grid connected electricity consumption (as measured in MWh)
$\mathbf{EF_{EL}}$	Carbon emission factor for grid electricity (taken from the most recent region specific eGRID values – measured in $lbCO_2$/MWh)
2204.62	$lbCO_2/tCO_2$

Equation 3c: CO_2 emissions from methane destruction

$$\mathbf{MD_{CO2} = CH_{4combusted} * CH_{4EF}}$$

Where:

$\mathbf{MD_{CO2}}$	CO_2 emissions from methane destruction (tCO_2)

[14] Relevant GHG emission factors can be found here: http://theccx.com/docs/misc/GHG_Emission_Factors.pdf

$CH_{4combusted}$	Annual methane combusted (as measured in Mg/yr)
CH_{4EF}	Carbon emission factor for combusted methane (Project Proponents shall use 2.75 tCO_2/tCH_4)

8.3 Calculation of Project Emission Reductions

Equation 4: GHG Emission Reductions

$$ER = (CH_{4combusted} * 21) - PE$$

Where:

ER	Total Emission Reductions (tCO_2e)
$CH_{4combusted}$	Annual methane combusted (as measured in Mg/yr)
21	Global warming potential of methane
PE	Project emission sources should be subtracted using Equations 3a, 3b, and 3c

9. REPORTING AND RECORD-KEEPING REQUIREMENTS

The Project Proponent must maintain all relevant data and documentation as required in Section 7 above. All relevant Project documentation shall be kept for a minimum of 2 years beyond each verification time-period.

10. VALIDATION AND VERIFICATION REQUIREMENTS

10.1 Validation

CCX Projects utilizing these guidelines are validated one of two ways. All projects must submit a PID to CCX Staff for review. Projects that adhere strictly to the requirements of this protocol are validated by CCX staff and do not require a separate Validation by the CCX Offsets Committee. For all Projects seeking to deviate from specific components of this protocol, the Project Proponent is required to complete the deviation request section of the PID for review and approval by the CCX Offsets Committee. Upon receipt and review of the deviation request, the CCX Offsets Committee will review the feasibility and appropriateness of the requested deviation(s) and, as needed, seek guidance from appropriate technical experts. Under either approach, the Project Proponents will be notified of the Project or Deviation approval by notification letter.

10.2 Verification

Prior to undertaking verification, the prospective Verifier must conduct a Project specific conflict of interest process. The prospective Verifier must complete and submit the CCX Project Specific Conflict of Interest Form[15] to CCX for approval prior to the commencement of verification activities.

Projects seeking to register Offsets shall be verified by a CCX-Approved Verifier[16] in accordance with CCX General Offsets Program Provisions, CCX Verification Guidance Document and the Project Protocols. A checklist list of verification requirements is contained in Appendix A. Independent verification is critical to ensure that the requirements of this Protocol are correctly applied. Projects shall be verified on an annual basis at minimum.

To ensure impartiality, completeness and consistency in the verification report review process an additional independent review of the submitted verification reports is conducted by the CCX Provider of Regulatory Services. Further information about the roles and responsibilities of Verifiers and the roles and responsibility of Members during verification are discussed in detail in *Chicago Climate Exchange Offset Program Verification Guidance* available on the CCX webpage: www.theccx.com.

[15] CCX Project Specific Conflict of Interest Form can be found in the Associated Documents section of the CCX website: www.theccx.com.
[16] A list of CCX-Approved Verifiers is found on the CCX website: www.theccx.com

APPENDIX A: VERIFICATION CHECKLIST

CCX Requirement	Assessment Criteria	Verification Findings
Validation	CCX Project Approval Letter.	
Verification: Conflicts of Interest	Complete a conflicts of interest assessment.	
Monitoring Plan	Confirmation that the Project developer has a Project data monitoring plan.	
Project Definition	Confirm the Project meets the definition and/or it has been specifically approved by the CCX Offsets Committee via a deviation request approval.	
CCX Membership	Confirm that the Project Proponent is a CCX Member or Participant Member (Offset Aggregator or Provider).	
Eligibility Governing Entities with Minor Emissions	Confirm that the Project Proponent is a small emitter as defined in Section 5.2 of the Project Protocol. If the Project Proponent is not a small emitter they must be a CCX emitting Member.	
Ownership Status	Confirm the Project Proponent has title to the CO_2 emission reductions and, if applicable, that the Offset Aggregator has the right to market them on CCX.	
Project Start Date	Confirm the Project began on or after January 1, 2003 or that it is a Project grandfathered by CCX.	
Project Location	Confirm Project is located in the U.S. or a Kyoto Protocol non-Annex 1 country.	
CMM Project Characteristics	Confirm that the area of influence of the mine has been properly determined according to the guidelines provided in section 5.6 of the Protocol.	

Regulatory Criteria	Confirm the Project is not required by federal, state, local law or other legally binding framework.	
Common Practice Criteria	Confirm that the Project activity has been deemed by CCX to be beyond business as usual for its country of origin.	
Identification of GHG Sources Sinks and Reservoirs	Confirmation of the identification of all Sources, Sinks and Reservoirs.	
Project Emissions	Confirm that Project emissions have been properly included as per the Project accounting methods described in the Protocol.	
Monitoring Requirements	Confirm existence of a Project data monitoring plan with procedures for obtaining, recording, compiling and analyzing data and required information.	
Flow Monitoring	Confirmation of continuous flow monitoring requiring measurement and recording, at least, every 15 minutes.	
	Confirmation the flow meter is installed in a location which allows for laminar flow or appropriate technology and professional engineering assessment of meter accuracy.	
Flow Meter Performance Standard	Confirmation of manufacturer's specification that the flow meter accuracy is +/- 5% of reading.	
	Proof of initial calibration.	
	Confirmation of capability to record flow, at least, every 15 minutes.	
	Confirm the flow meter has a means to correct for temperature and pressure, where applicable.	
Flow Meter Calibration	Confirm annual (or more frequent) flow meter calibration unless otherwise specified by the manufacturer.	

	Confirm calibration performed and documented to be in accordance with manufacturers specifications and methodologies.	
	Confirm that the calibration and testing organization was either the manufacturer, an ISO 17025 certified entity, or a manufacturer approved vendor.	
	Confirm records of calibration and calibration methodologies are documented and reviewed.	
Flow Meter Location	Confirm location provides for proper laminar flow or has been approved by professional engineer.	
Methane Content Analysis	Confirm that methane content analysis has been performed in accordance with the guidelines provided in section 7.2 of the Project Protocol.	
	Confirm device or approach used to determine methane fraction is conducted with a portable gas analyzer or by laboratory analysis of sampled gas.	
Gas Analyzer Performance Standard	Confirm the precision of the recordings to be to the nearest 0.1 percent.	
	Confirm measurement device is specified by the manufacturer to provide results that are +/- 10% of the actual reading.	
	Confirm alternative approach to determining methane quality meets the requirements that readings are +/- 10% of the actual reading.	
Gas Analyzer Calibration	Confirm calibration has been performed in accordance with the manufacturer's specification.	

Gas Analyzer Location	Confirm gas analyzer location is in conformance with section 7.2.3 of the Protocol.	
Electricity Production	If applicable, confirm the items provided in the cells below:	
	Type, make and model number of the engine.	
	Copy of most recent source test or manufacturer specified heat rate.	
	Monthly electricity production records.	
	Type of electrical metering device.	
	Proof that calibration of metering device is in accordance with the manufacturers' specification, if applicable.	
Destruction Device Operating Hours	Confirmation of continuous monitoring of operating hours of the destruction device.	
	Confirmation of existence of alarms, valves or other methods to ensure against venting to atmosphere.	
Destruction Device Efficiency	Confirmation of the use of the default value or the value specified by the manufacturer, if lower.	
Project Related Emissions	Confirmation of monitoring of Project related emissions.	
Calculation of Metered Methane Destruction	Confirmation of tabulated daily gas flows in scf/day.	
	Copy of at least weekly methane content readings.	
	Confirmation of monthly tabulation of methane flows by combining gas flows and methane content.	
	Confirmation of alternative calculation of methane destruction, if applicable.	
Calculation of Project Emissions	Confirmation of Project emissions calculations.	
Calculation of Project Emission Reductions	Confirmation of Project emission reduction calculations.	

Reporting and Record Keeping Requirements	Confirmation of procedures to retain relevant Project records for, at least, 2 years beyond the verification date.	