

Intent to Develop Alberta Offset System Quantification Protocol: **QUANTIFICATION PROTOCOL FOR DISTRIBUTED MICRO-GENERATION**

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.]

Intent [Describe the protocol activity and reduction opportunity]

This protocol quantifies GHG emissions that are avoided by consumers who are connected to the Alberta electricity grid when all or part of their electricity supply is substituted by

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.*

installing distributed micro-generation systems as defined in the **Micro-generation Regulation**².

This protocol acknowledges the unique nature of the distributed micro-generation in comparison to large scale generation. The distributed micro-generation is positioned at or near the consumption site i.e. at the load centers and consequently avoid system line losses as well as delay the need for additional generation or system upgrades. The large scale generation, on the other hand, is generally remotely located, requires an electricity grid to transport power, and therefore suffers a percentage of power loss during its transfer from generation to end user.

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.]

The baseline for project sites is a direct connection to the distribution system of the Alberta grid for all or part of the electricity consumption.

The current adoption rate for the distributed micro-generation systems in Alberta is very low. At such a low level of adoption, the distributed micro-generation cannot be considered as business as usual activity at this time. This protocol assumes the current standard practice of connecting to the Alberta grid for power supply as business as usual for the purposes of quantifying GHG reductions.

It is expected that this protocol would accelerate the adoption rate of distributed micro-generation systems in the province by allowing the owners of such systems to participate in Alberta's Carbon Offset system. This would help level the playing field between small and large generation projects in terms of monetizing the environmental benefits of low-carbon electricity production.

A significant benefit of this proposed protocol would be the broad participation potential it holds for Alberta. Even with relatively low market penetration rates that would be expected (e.g. 5% of grid connected electricity consumers over 20 years), tens of thousands of Albertans would be in a position to participate in the offset system. While the volume of carbon offsets generated would be quite modest in relation to the size of Alberta's emissions, easily less than one per cent of the total LFE emission profile, it would be one of the first protocols that is accessible to end users of energy at the consumer level. Simply put, a direct pathway for individuals to engage in the issue of climate change and take concrete action on emissions reductions.

² http://www.auc.ab.ca/rule-development/micro-generation/Documents/Micro_Generation/Microgen_Regulation.pdf

Project Condition [Explain the project condition, activity creating the emission reduction or removal, other relevant information.]

The project consists of installing distributed micro-generation on grid connected facilities primarily for local electricity consumption. Any excess generation is transported to the other connected downstream facilities. The project reduces greenhouse gas emissions generated in Alberta through the following processes:

- Displacing electricity on the grid with lower GHG intensive power sources;
- Reducing line losses through the close connection between electricity generation source and consumption site;
- Displacing the emissions associated with the construction of large electricity generation facilities, and transmission and distribution networks with smaller infrastructure requirements;
- Expanding Alberta's generation capacity in a manner that adds resilience to the grid and reduces infrastructure demands; and
- Placing the control of electricity generation and consumption in the consumer's hands thus improving awareness and encouraging energy efficient practices.

Although the projects under this protocol would result in all of these benefits, the quantification protocol addresses the first three bullets only as these are readily measurable and quantifiable.

The eligible project sites under this protocol must draw all or part of their power from the Alberta grid prior to start of the project. The projects substitute all or part of the electricity demand at grid connected facilities by installing distributed micro-generation systems. GHG emissions reduction will occur when the low GHG intensity distributed micro-generation systems displace the grid supplied electricity.

The emission reductions are based on:

- the difference in greenhouse gas emissions between the grid and micro-generation for the net electricity generated
- the difference in greenhouse gas emissions between the grid and micro-generation for the net electricity saved due to avoidance in line losses
- the difference in greenhouse gas emissions between infrastructure builds between grid electricity and micro-generation electricity, proportioned for consumption and amortized over life span.

The protocol accounts for the avoided line losses in calculating GHG savings due to the proximity of generation to the consumption site. The approach used is well supported by science. Electricity generation by the distributed micro-generation systems eliminates the need for sourcing the power from remotely located large electricity generation. Most of the distributed micro-generation output is consumed at the project site with negligible cost in line losses downstream for any excess power.

There are two types of line losses associated with large scale generation: transmission line losses and distribution line losses. The transmission line loss occurs when power is transported from centralized large scale generating plants at high voltages, and, the distribution line losses occur at low voltages when power is delivered to customers. The Alberta Electric System Operator or AESO publishes the line losses for each region in Alberta. The combined total line losses in Alberta account for an average of 14 % of the total generated power. Due to their unique positioning, Distributed Micro Generation in Alberta can be effective in eliminating the line losses in both the transmission and distribution systems.

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

This protocol has primarily been designed for aggregators who want to participate in the installations of the distributed micro-generation systems connected to the Alberta electricity grid; however, it can also be applied at the individual level.

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

The project activity covered in the protocol is not mandated by any regulation at this time, but is required to meet the conditions of local permits under municipal bylaws.

The only relevant regulation is the Government of Alberta's Micro-generation Regulation, released in 2008 to provide clarification on definitions and requirements for installations. Through this regulation, Government of Alberta established a framework to facilitate mass deployment of the technology and public participation; however, it does not mandate the installation of micro-generation and there remains a number of barriers to the implementation of micro-generation technologies (please refer to additionality section below).

Additionality [Explain how this activity result in real, quantifiable, and verifiable reductions beyond business as usual activity and government regulations. How does this protocol result in new, incremental greenhouse gas emission reductions and/or removals that would not otherwise have occurred?]

Micro-generation systems are an emerging technology that currently provides a negligible overall reduction to the GHG emissions intensity of electricity generation. In the absence of regulation or other market influences, adoption rates are not expected to increase.

The project utilizes a market based approach to stimulate adoption of technology that provides lower GHG emissions intensity generation, which is proven through measurable results. These results are derived from actual production data that is acquired through monitoring that includes data management, quantification and verification processes.

Barriers [Identify barriers that would, in absence of the Offset protocol, dis-incent or prevent this activity or project from taking place.]

This protocol helps to address financial barriers to micro-generation technologies, and provides a signal of support to the market to assist in overcoming technological, social and regulatory barriers.

Financial Barriers

High capital cost and longer payback periods are still the biggest hurdles in mass scale acceptance of the micro-generation systems. The generation cost per unit of energy for micro-generation spread over the life of the asset is greater than the current cost of power sourced from the grid. Monitoring the carbon offset benefits of micro-generation systems will offset the higher lifecycle costs as shown in the following example:

Costs	Alberta Grid	Micro-Generation
		Solar
Upfront Costs	N/A	\$8500.00
Expected Generation	63840 kWh	63840 kWh
Current per unit cost	11.5 cents/kWh	13.3 cents/kWh

The protocol provides a direct monetary incentive that contributes to overcome the financial barriers, which encourages further adoption.

Technological Barriers

There are two technological barriers; supply chain and operations and maintenance (O&M). Supply chain: Micro-generation faces a fractured supply chain, lack of manufacturers and lack of qualified independent contractors for installation, which impedes homeowners from implementing micro-generation.

Operation and maintenance: There is a lack of experienced personnel in servicing distributed micro-generation, which tends to prevent the long term operation of this type of generation.

Social Barriers

Lack of Information: -

Availability of limited information is a big hurdle in mass penetration of distributed micro-generation systems. Consumers in Alberta are either unaware or poorly informed of the various choices they have to source their electricity, and also contribute towards addressing climate change. The lack of awareness about the technological and operational know-how is a critical barrier in making decisions to install these systems.

Institutional: Customers are aware about the benefits but skeptical about the expected performance and high cost. The technologies are in the initial phase of mass implementation in Alberta.

Others: Regulatory- Beyond the Micro Generation Regulation there are no regulations to support or implement such technologies.

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?]

The protocol proposes an ex-post measurement system and therefore permanence is not a concern.

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.]

Leakage can appear in the form of carbon shifting and economic effects

Carbon shifting

The protocol includes the emissions from manufacturing the micro-generation components and consequently captures any carbon shifting along that direction of the life cycle. The protocol also captures any carbon shifting upstream by including the source of fuel (e.g., the mining of coal, the generation of solar energy) within the boundaries. The consumption of the energy during the project represents the terminus for the energy and hence carbon shifting is accounted for downstream of operation. Finally, decommissioning of the micro-generation systems when compared to the Alberta grid is been considered to be immaterial.

Economic effects

Economic effects are of concern when the project encompasses enough of the market to change the market dynamics. It is unlikely at the current implementation rate that micro-generation will capture more than 5% of the market in the next 20 years (*show implementation graph relative to market size*). Another concern of market effects whether the re-use of baseline components will shift markets in the baseline scenario is not significant as the current generation assets on the Alberta grid will remain unaffected by the introduction of micro-generation given the current anticipated demands for electricity in Alberta.

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

Conservativeness of the emission reduction is expressed in two manners, one through the selection of the baseline scenario and the second through the quantification methodologies. The baseline scenario in the protocol is a conservative representation of the emission intensity of the grid. This can be seen through the information released in Canada's GHG Inventory and AESO statistics.

	Baseline – Alberta Environment Approved Offset Value	Canada GHG Inventory
Grid Intensity (tonne CO ₂ e/MWh)	0.65	0.88*

* AB grid intensity as reported in 2008 National Inventory reporting.

Conservativeness of the quantification methodology is applied when completeness and accuracy cannot be obtained. This occurs when there is incomplete information or high uncertainty.

The protocol recognizes such occurrences of having incomplete information during the project when there is an operational failure of the distributed micro-generation systems or a data malfunction. In case of such incidences, the calculation will automatically assume that all power consumed during that period is generated by the grid. See the attached “Micro-generation Data Quantification Plan” as an example of the proposed data management plan.

A sensitivity analysis conducted on the commissioning and decommissioning elements of the project was found to be immaterial to the emissions reductions from the project. Maintenance though a small component of the emission reduction is included in the calculation. Factors and assumptions used in the maintenance over estimate the project emission and underestimate the baseline emissions.

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 primarily designed for aggregators and as such, has risks related to the aggregation process. In particular, critical to the implementation of this protocol will be the requirement for a relatively robust data management system to ensure completeness, accuracy and verifiability of the information. As a consequence, any aggregator using this protocol will need to demonstrate that this data management will exist during the life of the project.

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

There is one key measurement that is required, which is the measurement of electricity produced by the micro-generation system. Each system has the capability of measuring and storing this information. This information is housed at the installation. The offsite sample is readily accessible and is maintained by a third party. All individual systems can be accessed

upon request.

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

Ownership of the offset credits is transferred to the aggregator from the owner of the residence through a contract.

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.]

Currently, there isn't any protocol in Alberta's offset system that deals with distributed generation. The two existing protocols, one for wind power generation and another for solar PV electricity generation both are designed for commercial scale MW size generation.

The proposed protocol applies to distributed micro-generation systems as defined in Micro-Generation Regulation.

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

- Reduction in other air pollutants like SO₂, NO_x, PM, Hg etc
- Encourage market penetration of distributed generation
- Saves infrastructure development cost by providing demand side energy management or energy efficiency
- Create additional green jobs and entrepreneurship opportunities for the green industry/business opportunities

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

There are no known major environmental impacts from the project activities.

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.]

August 1, 2011. ENMAX will engage the Technical Review Panel to review the draft protocol and supporting documents and estimates it will take 3 months to complete the task.