Methodology Validation Report for Maine State Housing Authority

Voluntary Carbon Standard 2007.1

November 2010

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1 Introduction

This report is provided to Maine State Housing Authority (MaineHousing) as a deliverable of the first Voluntary Carbon Standard 2007.1 (VCS) Methodology Element validation assessment process, the proposed VCS Methodology Element titled *Methodology for Weatherization of Single and Multi-Family Buildings*. This report provides a description of the steps involved in conducting the first validation assessment and summarizes the findings of the first validation assessment performed on the basis of the VCS 2007.1 and the VCS Program Normative Guidance Document: Double Approval Process, Version 1.0 (VCS Program Document).

The Audit Team was provided the original proposed Methodology Element on January 14, 2010. Based on this documentation, a document review and desktop audit took place, which resulted in Corrective Action Requests (discussed later in this report) and revisions to the proposed Methodology Element. The final version, Version 3.2 dated June 28, 2010, serves as the basis of the final conclusions presented herewith.

1.1 Objective

The purpose of the Methodology Element validation assessment is to have an independent third party assess the proposed Methodology Element's conformance with VCS requirements.

1.2 Scope and Criteria

The validation assessment scope is defined as an independent and objective review of the proposed Methodology Element. The validation assessment is conducted using the Voluntary Carbon Standard 2007.1 and the VCS Program Normative Guidance Document: Double Approval Process, Version 1.0 as the criteria. Additionally, First Environment applies its professional judgment as informed by ISO 14064-2 and 14064-3 in assessing the proposed Methodology Element.

1.3 Assurance

First Environment, Inc. (First Environment) and MaineHousing have agreed that a reasonable level of assurance be applied to this assessment.

2 Methodology

The following validation process was used:

- conflict of interest review;
- selection of validation team;
- kick-off meeting with MaineHousing;
- development of the validation plan;
- desktop review of the Methodology Element and other relevant documentation;
- follow-up discussions with MaineHousing for supplemental information, as needed;

- corrective action cycle; and
- validation report development.

The validation process was utilized to evaluate whether the Methodology Element's approach is consistent with VCS 2007.1 and the VCS Program Document. A validation conformance checklist was developed for the Methodology Element which summarizes the criteria used to evaluate the Methodology Element, the Methodology Element's conformance with each criterion, and the Audit Team's validation findings.

Conflict of Interest Review

Prior to beginning any validation project, 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 energy efficiency and weatherization.

Keith Dennis – Lead Auditor
Iris Caldwell – Auditor
Michael Carim – Auditor
Tod Delaney – Technical Expert
Jay Wintergreen – Internal Reviewer

Audit Kick-off

The validation process was initiated with a kick-off meeting in Augusta, Maine on December 29, 2009 between Keith Dennis of First Environment and the primary MaineHousing contacts, Dale McCormick, Lucy Van Hook, and Jo-Anne Choate. Two consultants to MaineHousing, Sandra Greiner of Climate Focus and Cathy Lee of Lee International, joined the meeting by phone. The communication focused on confirming the validation scope, objectives, criteria, schedule, and the information required for the validation assessment.

Development of the Validation Plan

Based on the information discussed during the kick-off meeting, the Audit Team formally documented its validation plan and provided the validation plan to MaineHousing.

Corrective Actions and Supplemental Information

The Audit Team issued requests for corrective action and clarification during the validation assessment process. The corrective action and clarification requests and the responses provided are summarized in Section 2.3.

Validation Reporting

Validation reporting, represented by this report for MaineHousing, documents the validation assessment process and identifies its findings and results.

2.1 Review of Documents

Eligibility requirements, baseline approach, additionality, project boundary, emissions, leakage, monitoring, data and parameters, and other pertinent criteria were assessed to evaluate the proposed Methodology Element against VCS program requirements. Discrepancies between the proposed Methodology Element and the validation criteria were considered material and identified for corrective action.

2.2 Follow-up Interviews

The Audit Team held teleconferences with the following individuals throughout the course of the Methodology Element assessment:

- Dale McCormick (MaineHousing)
- Lucy Van Hook (MaineHousing)
- Cathy Lee (Lee International)
- Sandra Greiner (Climate Focus)
- Bamshad Houshyani (Climate Focus)

2.3 Resolution of Any Material Discrepancy

As described above, the Audit Team requested corrective actions, clarification, and supplemental information during the validation process. The corrective action and clarification requests and the responses are summarized in the tables below. It should be noted that the table and section numbers of the proposed Methodology Element referred to in the requests may have changed after the proposed Methodology Element was revised. As indicated, MaineHousing adequately resolved all of these requests.

Requests for Corrective Actions and Clarification

ID	Corrective Action Request	Summary of Methodology Element Developer Response	Validation Conclusion
1	No criteria or procedure is established for quantifying HFC emissions leakage emissions from improper disposal of appliances. Please correct.	Revised Methodology Element includes procedure for quantifying HFC emissions leakage emissions from improper disposal of appliances.	Response is acceptable.
2	Provide justification and evidence that the Methodology Element includes adequate criteria and procedures for identifying leakage emissions (i.e., emissions related to the project occurring outside of the boundary).	MaineHousing provided a detailed assessment of leakage that included the most significant potential leakage sources and justified their inclusion or exclusion from the Methodology Element.	Response is acceptable.

ID	Corrective Action Request	Summary of Methodology Element Developer Response	Validation Conclusion
3	Provide justification and evidence that the Methodology Element uses conservative assumptions, values, and procedures to ensure that GHG emission reductions or removal enhancements are not overestimated. Specifically, justify the assumptions behind the electricity consumption factor (ECF) that leads to the assertion that "failure to adjust for increasing consumption over time would result in an under-estimation of emission reductions" (i.e., that a specific project site's efficiency would necessarily decline at the same rate as regional trends).	The Methodology Element was revised so that ECF can be used only in the case where emission reductions would be adjusted downward to account for efficiency gains that could be expected to occur in the absence of the project. As a result of the revision, the assumptions used are more conservative.	Response is acceptable.
4	The performance standard for Category C and D in the proposed Methodology Element are not sufficiently robust, please correct.	The Methodology Element was revised with a more robust performance standard for Category C and no identified performance standard for Category D.	Response is acceptable.
5	The title page of the Methodology Element identifies a different version and issuance date than the footer. Please correct.	Methodology Element and footer issuance date have been corrected and now match.	Response is acceptable.
6	Please clarify (in the Methodology Element) how weatherization best practice standards referred to in Section 1.3.1 are defined, including who develops them and where they can be found.	Additional clarification language has been added to the Methodology Element in Section 1.3.1. Specifically, the standard was defined as "according to nationally recognized weatherization best practice standards" and a footnote with further clarification is provided in the proposed Methodology Element.	Response is acceptable.
7	Please clarify (in the Methodology Element) how "part of the year" is defined in Section 1.3.3.	The definition has been updated in the proposed Methodology Element to include "The dwelling must be fully occupied. Vacancy is permitted on an intermittent basis for up to three months, or if the dwelling is occupied seasonally on an annual basis."	Response is acceptable.

ID	Corrective Action Request	Summary of Methodology Element Developer Response	Validation Conclusion
8	In Section 1.7, the Methodology Element identifies "However, the base temperature can vary by building type and thermostat setting." Please clarify the standard to ensure the language does not allow project developers to select an advantageous base temperature for their project.	Section 1.7 in the Methodology Element is provided as an explanation of what Heating Degree Days are and how they are calculated. When calculating the Heating Degree Days, a recognized authority uses an established base temperature that is specific to the region. The base temperature from which the Heating Degree Days are calculated remains constant across years. When applying the Methodology, the Project Proponent will not have to calculate the Heating Degree Days and therefore will not be able to determine or manipulate the base temperature. Instead, the Project Proponent will obtain the Heating Degree Days value from regional statistics. To avoid confusion, we have removed the sentence "However, the base temperature can vary by building type and thermostat setting."	Response is acceptable.

ID	Summary of Clarification Request	Summary of Methodology Element Developer Response	Validation Conclusion
1	Please provide information as to whether you made use of a template for this Methodology Element, and if so, which one.	MaineHousing indicated that they used CDM small-scale methodologies as a basis for their approach.	Response is acceptable.
2	Please provide information as to the intent to include/exclude greenhouse gas emissions within the project boundary and how the Methodology Element meets the requirements of VCS 2007.1 Section 6.2.	MaineHousing added a table indicating included and excluded gases to the Methodology Element to clarify this issue.	Response is acceptable.
3	Please clarify/justify that the term "building envelope" is sufficient to meet the VCS boundary requirements. Also, please clarify if the boundary is identical for each project category.	MaineHousing provided justification for use of building envelope as a boundary for all four project categories including clarification of how it encapsulates all relevant GHG sources, how it is a well-established term used by the US Department of Energy, and how it is more refined that CDM small-scale methodology AMS II.E, which defines the Project boundary as "the physical and geographical site of the buildings."	Response is acceptable.

ID	Summary of Clarification Request	Summary of Methodology Element Developer Response	Validation Conclusion
4	Please provide evidence of that the Methodology Element meets Section 6.1 of VCS 2007.1, including evidence of the comparative assessment described in the standard. Please provide evidence that it also meets all requirements of section 6.3 of VCS 2007.1 with respect to establishing "criteria and procedures for identifying and assessing potential baseline scenarios."	Through written response and follow-up interview, MaineHousing clarified their process of conducting a comparative assessment through years' worth of study and project implementation. Through written response and a follow-up interview, MaineHousing clarified their process of conducting a comparative assessment relied on many years of data and clarified that its criteria and procedures comply with Section 6.3 of the VCS 2007.1.	Response is acceptable.
5	Please provide evidence/justification to support that the Methodology Element's requirements for monitoring of annual working hours of appliances (h_k) meet the requirements of VCS 2007.1.	MaineHousing adjusted the Methodology Element to clarify use of h_k, and clarified that any surveys require that the sampling size be determined based on an equation taken from the IAF Guidance on the Application of ISO/IEC Guide 66 (IAF GD6:2006).	Response is acceptable.
6	A Project proponent database is referred to in several tables as a source for monitored data, but not in the main text of the Methodology Element. Please provide details as to whether the Methodology Element requires this database and if there are any minimum requirements for format of the database and the information it must contain.	MaineHousing clarified that the database simply indicates that the project developer must maintain data related to the monitored parameters. The exact format is not defined or relevant to the Methodology Element.	Response is acceptable.
7	Table 2 and 3 indicate that the $Elect_{CO2}$ must be "Obtained from a recognized authority; or calculated by the Project based on raw data obtained from a local, or national electric utility." Please clarify what is meant by the "Project" in this case.	MaineHousing clarified that this was a typo and fixed it in the final version of the Methodology Element.	Response is acceptable.
8	Please provide additional information with respect to which applicability and eligibility requirements were considered for this project.	MaineHousing added significantly to the eligibility and applicability section of the Methodology Element, including components related to the condition of the dwelling, safety and regulatory compliance of the project activity, and occupancy requirements.	Response is acceptable.

ID	Summary of Clarification Request	Summary of Methodology Element Developer Response	Validation Conclusion
9	For the parameter h_k, please clarify why the source for Tables 2, 3, and 4 (Homeowner or contractor) differs from the source in Table 5 (Homeowner, contractor, sampling, consumer surveys, or common practice based on local, regional or national data). Also, please clarify why only Table 5 provides opportunity for updates of the value.	MaineHousing adjusted the Methodology Element to clarify source of h_k as being from sampling, consumer surveys, or common practice based on local, regional or national data, and clarified that any surveys require that the sampling size be determined based on an equation taken from the IAF Guidance on the Application of ISO/IEC Guide 66 (IAF GD6:2006). The revisions also improved consistency between the tables.	Response is acceptable.
10	Consumer surveys are referred to as a source of monitored data in Table 6 for parameter h_k. Please provide a description of the requirements, if any, for these surveys given the structure of the Methodology Element.	MaineHousing adjusted the Methodology Element to clarify use of hk, and clarified that any surveys will be sampled in manner consistent with IAF guidance.	Response is acceptable.
11	Surveys conducted by the Project proponent are referred to as the source of monitored data in Table 5 and 6 for $Corr_k$. Please provide a description of the requirements, if any, for these surveys given the structure of the Methodology Element.	MaineHousing clarified that any surveys require that the sampling size be determined based on an equation taken from the IAF Guidance on the Application of ISO/IEC Guide 66 (IAF GD6:2006).	Response is acceptable.
12	Please provide information as to whether, during the Methodology Element development, any safeguards were considered to ensure that poor efficiency is not purposely undertaken to increase the amount of emission reductions claimed by the project.	MaineHousing clarified that deliberate inefficiency had been considered in the Methodology Element development and the logic as to the safeguards against this act as well as safeguards inherent in VCS standards. Specifically, Section 3.1 of VCS 2007.1 specifically excludes projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction.	Response is acceptable.
13	Please discuss whether uncertainty and efforts to mitigate any uncertainty with respect to data (including monitored parameters) were addressed during development of the Methodology Element.	MaineHousing provided documentation of how uncertainty is mitigated in the Methodology Element through use statistical analysis, auditing practices, and documented data sources.	Response is acceptable.

ID	Summary of Clarification Request	Summary of Methodology Element Developer Response	Validation Conclusion
14	Please clarify how the Methodology Element addresses operational changes in the use of the residence that could affect energy use during the crediting period.	MaineHousing added a level of operational requirements to the eligibility requirements and clarified other aspects of the monitoring that safeguard against any significant affect on emission reduction calculations. Specifically, MaineHousing clarified how the sampling approach that examines a group of dwelling as a whole mitigates against affects of operational changes in dwellings and how weather normalization mitigates the affects of operational changes in heating and cooling levels.	Response is acceptable.
15	The parameter a_k appears in Equation 12 as number of appliances of type k. This parameter is not included in any monitored parameter table. Please clarify whether this is the same parameter as $a_{np,k,y}$.	MaineHousing clarified that these are the same parameter and made changes to the Methodology Element to improve consistency.	Response is acceptable.
16	Table 6 and equation 11 use a term "Degree Days" or "DD," described as "heating or cooling degree days in year y." Section 1.7 of the Methodology Element describes "heating" and "cooling" degree days, but not "degree days" as a stand-alone parameter. Please clarify the definition of "degree days" in this case.	MaineHousing clarified in which case heating degree days or cooling degree days should be used in the revised version of the Methodology Element.	Response is acceptable.
17	In Table 3, the units provided for the parameter $H_{load,pre,i}$ and $H_{load,post,i}$ (kWh/m2, Therms, Gjoules) differ from those in Table 6 (GJoules/m2/DD). Please clarify why the same parameters have different units and why some are on a per m^2 basis and others are not.	MaineHousing revised the Methodology Element to make the units consistent.	Response is acceptable.
18	Please provide information on the leakage assessment conducted in the development of the Methodology Element other than leakage from appliances not properly disposed of, or discuss whether any other potential leakage scenarios were assessed.	MaineHousing provided a detailed assessment of leakage that included the most significant potential leakage sources and justified their inclusion or exclusion from the Methodology Element.	Response is acceptable.
19	Please provide a definition of "disposed of properly." Please indicate whether there would be a level of assurance that this term would be applied consistently across projects.	MaineHousing clarified the requirements for disposal documentation in the Methodology Element, which include documentation to confirm the operation of the appliance is prevented the disposal has been completed in compliance with applicable laws and regulations.	Response is acceptable.

ID	Summary of Clarification Request	Summary of Methodology Element Developer Response	Validation Conclusion
20	With respect to energy load, which is determined on a BTU/m^2 basis, please elaborate on the use of m^2 as the denominator for this metric. Please indicate whether, in the course of determining this metric, there will be consideration of the variety of space uses within the dwelling. Please indicate whether this is considered in the Methodology Element and whether there are assurances that the definition of m^2 will be used consistently across projects and samples.	MaineHousing clarified that the use of the energy load metric is used pre- and post- retrofit on the same dwelling and should be applied consistently within the dwelling.	Response is acceptable.
21	Please justify the monitoring frequency of $Elec_{CO2}$ of ten years. In addition, please confirm that the electricity emission factor will be the same for baseline and project emissions in any given year.	MaineHousing made changes to increase the monitoring frequency of this parameter to either annually or per the procedures prescribed in the most recent CDM "Tool to calculate the emission factor for an electricity system" and confirmed that the emission factor is the same in the baseline and project year.	Response is acceptable.
22	Please indicate whether you have conducted any pilot projects with this Methodology Element and/or whether you have sample data that have been used to "test" the equations used in the Methodology Element. If so, please indicate whether this data would be available for review during the validation process.	MaineHousing clarified the extent of their testing and provided a sample project document to aid the review of the Methodology Element.	Response is acceptable.
23	Please discuss the use of heating and cooling degree days and electricity correction factors, used to adjust the baseline scenarios, in the context of conservativeness as described in Sections 5.1 and 6.3 of VCS 2007.1. Please provide all assumptions underlying the use of these correction factors in the context of conservativeness.	MaineHousing clarified the use of HDD and CDD to adjust only for the relevant fuels based on best practices. The Methodology Element was revised to eliminate use of ECF to adjust emission reductions upward. As a result of the revision, the assumptions used are more conservative.	Response is acceptable.
24	Please describe the assumptions that lead to the application of the electricity consumption factor based on regional statistics to an individual dwelling's baseline electricity use.	The Methodology Element was revised to eliminate use of ECF to adjust emission reductions upward. As a result of the revision, the assumptions used are more conservative.	Response is acceptable.
25	Please clarify how the effects of hot weather are not accounted for twice in this Methodology Element (once by the CCDCF and once by the ECF). Please describe how these assumptions meet the requirements and principles of Sections 5.1 and 6.3 of VCS 2007.1.	The Methodology Element was revised to eliminate use of ECF to adjust emission reductions upward. As a result of the revision, the assumptions used are more conservative.	Response is acceptable.

ID	Summary of Clarification Request	Summary of Methodology Element Developer Response	Validation Conclusion
26	Please explain and justify the assumptions that lead to the use of CDDCF for electric use and HDDCF for fuel use in Equation 4.	MaineHousing clarified the use of HDD and CDD to adjust only for the relevant fuels that either heat or cool, based on best practices.	Response is acceptable.
27	Please explain why in several of the monitoring parameter tables, units for the fuel consumption are on a per dwelling basis, but units for electricity do not specify a per dwelling basis.	MaineHousing clarified this point, and the project descriptions indicate that both measures are per dwelling.	Response is acceptable.
28	Please indicate whether weatherization projects involved in this project could be considered, in some cases, mandated by law.	MaineHousing clarified that the additionality tests and VCS standards provide safeguards against projects receiving credit if mandated by law and included an exclusion for such projects in the eligibility requirements.	Response is acceptable.
29	Please indicate the unit for P_{90}.	MaineHousing clarified that this unit is a value at the 90^{th} percentile and is dimensionless.	Response is acceptable.
30	On Page 8, under Equation 5 methodology identifies "x= the value of the data point at rank n calculated in equation 2a." Please clarify whether this is a typo and if so, correct.	Equation 2a is a typo and should read equation 5a. The language in the Methodology Element has been corrected.	Response is acceptable.
31	Please clarify whether the monitoring parameters for improperly disposed appliances should be included in the pre- and post-retrofit approach table and if so, correct.	The monitoring parameters for improperly disposed of appliances should be included in the pre- and post-retrofit approach table and have been added in the Methodology Element.	Response is acceptable.
32	As a key source of the methodology, please clarify the sections of the IAF Guide to ISO/IEC Guide 66:1999 that are directly applicable to meeting the functions required of it by the methodology (such as sampling by survey). Clarify whether the version of the guide referred to is still valid and please provide a copy of the version of the document referenced in the proposed Methodology Element for review as part of the validation process.	MaineHousing updated the proposed Methodology element to refer to the most recent version of the IAF Guide (Issue 4 IAF GD6:2006). Additionally, rather than refer broadly to the IAF Guide, MaineHousing added a specific equation from the Guide to clarify exact requirements for sample size.	Response is acceptable.

3 Assessment Findings

The Methodology Element validation assessment includes evaluation of elements of the proposed Methodology Element against specific VCS program requirements. A summary of the proposed Methodology Element's approach and First Environment's assessment is provided below.

3.1 Eligibility Criteria

The proposed Methodology Element is applicable to weatherizing whole buildings, replacing mobile homes, or implementing individual energy efficiency measures within existing dwellings. The proposed Methodology Element establishes four categories for applicable interventions including:

- Category A - All energy retrofit: A combination of energy efficiency measures directed at the building envelope (i.e., air infiltration, insulation), improving the efficiency of the central heating and/or cooling system and reducing energy consumption of appliances (i.e., replacement of refrigerators, air conditioning units, lamps, showerheads).
- Category B - Efficiency enhancement of the building envelope and central heating and/or cooling system only.
- Category C - Replacement of appliances currently in service.
- Category D - Replacement of a mobile home currently occupied.

The proposed Methodology Element clearly identifies criteria by which to assess the eligibility of weatherization projects for single and multi-family buildings. Specifically, the Methodology Element requires that the following eligibility requirements be met:

- The condition of the dwelling shall be and remain adequate for Project activities according to weatherization best practice standards. Project activities may not result in a violation of health and safety, environmental, or other relevant regulations.
- The replacement appliances and mobile homes must replace functioning appliances and/or occupied homes.
- The dwelling must be occupied for at least part of each year.
- The capacity of any replacement appliance or replacement component of a central heating/cooling system shall satisfy the post-retrofit heat load, cooling load, and electricity demand ("Energy Load") within the dwelling.
- In the case of district heating systems, all residential dwellings connected to the system shall be included in the Project.
- The Project activity must not be mandated or required by local, state, or federal law or regulation.

The proposed Methodology Element is applicable for a 10-year crediting period.

The criteria identified provide a clear basis for determining the Methodology Element's applicability to potential project activities. First Environment concluded that eligibility requirements are appropriate and adequate.

3.2 Baseline Approach

The proposed Methodology Element establishes the baseline scenario as the condition most likely to occur in the absence of the Project in each project category. This represents the fossil fuel and electricity needed to meet heating and cooling loads, and appliance loads, as relevant,

prior to Project implementation. Baseline emissions are calculated by procedures described below in Section 3.5 of this report. First Environment concluded that this approach to determining baseline is appropriate and adequate.

3.3 Additionality

The proposed Methodology Element allows projects to demonstrate additionality through either the Project Test using the most recent Clean Development Mechanism (CDM) small-scale additionality barrier test, or the VCS Performance Test that incorporates the Performance Standard approved for the sector.

The Performance Standard for project Categories A, B, and C are defined within the proposed Methodology Element. No Performance Standard is defined for Category D so the category must use the CDM small-scale additionality test.

The Performance Standard defined in the protocol for Categories A, B, and C are based on statistical analyses. For Categories A and B, the Performance Standard is a value above the benchmark that represents a percent savings in energy consumption that dwellings are not likely to reach with 90 percent certainty in the absence of the Project. The benchmark is calculated through a statistical analysis that involves sampling weather normalized energy consumption in dwellings from the "Same Building Stock," which is defined in the Methodology Element, to be based on similar characteristics considering geographic region and occupancy.

For Category C, the Performance Standard is a value below the benchmark that represents a level of energy consumption that appliances are not likely to reach with 90 percent certainty in the absence of the Project. The benchmark is calculated through a statistical analysis that involves sampling the average energy consumption of existing appliances or using national appliance data.

For Categories A, B, and C, the analysis involves calculating the standard deviation of the sample to conduct the analysis if the sample follows a normal distribution or to find the 90^{th} percentile value if it does not follow a normal distribution.

After following these statistical procedures, a benchmark is set and performance that exceeds the performance benchmark passes the Performance Standard test.

First Environment determined that this approach to determine additionality is appropriate and adequate.

3.4 Project Boundary

The project boundary is defined as the building envelope of the dwelling(s) and its heating and cooling equipment. Throughout the course of the validation, MaineHousing justified the definition of the boundary, which First Environment found to be an appropriate and adequate approach for the definition of the project's physical boundary, sources, and types of GHGs included.

The "building envelope" separates the interior and exterior of a building. It is an adequate Project boundary because it can easily be described and contains the total energy consumption within a dwelling. It also delineates GHG emissions that are reasonably attributable to and under the control of the Project participants. The concept of building envelope is widely known, understood and used by the US Department of Energy in the national weatherization program and building energy experts, including energy auditors, contractors, architects and other building professionals. The use of a building envelope is more refined than the concept used by the CDM small-scale methodology AMS II.E, which defines the Project boundary as "the physical and geographical site of the building(s)."

The proposed Methodology Element summarizes the relevant emissions sources in Table 3 and indicates whether each is included in the project boundary. Consistent with 2006 IPCC Guidelines for National Greenhouse Gas Inventories, CH_4 and N_2O emissions are considered negligible and therefore are excluded from the project boundary. First Environment determined that the proposed Methodology Element provided sufficient criteria to establish the project boundary and that all relevant emission sources and GHGs are included.

3.5 Emissions

The proposed Methodology Element presents five approaches to calculating emission reductions and related monitoring parameters. They are: 1) the adjusted consumption approach, 2) the pre- and post- retrofit audit approach, 3) the control group approach, 4) the deemed savings approach, and 5) the mobile homes approach. Equations required to calculate emission reductions under each approach and monitoring parameters applicable to each approach are listed in Part C of the proposed Methodology Element.

Baseline Emissions Quantification

In the adjusted consumption approach, available to Categories A, B, and D, baseline electricity and fuel consumption is monitored for a period of 12 months prior to the project activity. These data are multiplied by the relevant energy contents and emission factors for each energy type.

In the pre- and post- retrofit audit approach, available to Categories A and B, a pre-retrofit audit is conducted to determine the electricity load and heat load in the baseline. Through use of a calculated energy demand factor and heat load reduction factor, these data are multiplied by the relevant energy contents and emission factors for each energy type.

In both the adjusted consumption approach and the pre- and post- retrofit audit approach, the baseline emissions are also adjusted by heating and cooling degree days to account for changes in weather during the project year. Additionally, electricity may be conservatively multiplied by an electricity correction factor to account for any potential gains in electrical energy efficiency that could be expected in the absence of the project. Additionally, when using this approach, a control group sample of dwellings is used to provide quality assurance for the baseline data.

In the control group approach, available to Categories A, B and D, a control group of dwellings from the Same Building Stock that are not weatherized, nor weatherized during any part of the crediting period, are monitored. Electricity and fuel use of the control group are multiplied by the

relevant energy contents and emission factors for each energy type to determine baseline emissions.

In the deemed savings approach, only applicable to Category C, baseline emissions are determined by the electricity demand of the appliance to be replaced through the nameplate capacity, manufacturer's specification sheet, or direct metering. This demand is multiplied by hours or operations determined through sampling, surveys, or best practice and corrected for equipment failure determined through monitoring during the crediting period. These data are multiplied by the relevant emission factors to quantify baseline emissions.

For the mobile homes approach, applicable only to category D, the baseline emissions are determined through best practice heat load modeling of the home to be replaced. The baseline emissions are adjusted by heating and cooling degree days to account for changes in weather during the project year. These data are multiplied by the relevant energy contents and emission factors for each energy type to quantify baseline emissions.

All formulae and quantification methods were reviewed for accuracy and appropriateness. First Environment concluded that the approach to calculate baseline emissions is appropriate and adequate.

Project Emissions Quantification

In the adjusted consumption approach, available to Categories A, B, and D, project electricity and fuel consumption is monitored for the project activity. These data are multiplied by the relevant energy contents and emission factors for each energy type to quantify project emissions.

In the pre- and post- retrofit audit approach, available to Categories A and B, a post-retrofit audit is conducted to determine the electricity load and heat load in the project case. Through use of a calculated energy demand factor and heat load reduction factor, these data are multiplied by the relevant energy contents and emission factors for each energy type to quantify project emissions.

In the control group approach, available to Categories A, B and D, project electricity and fuel consumption is monitored for the project activity. These data are multiplied by the relevant energy contents and emission factors for each energy type to quantify project emissions.

In the deemed savings approach, the only approach available to Category C, project emissions are determined by the electricity demand of the replacement appliances through the nameplate capacity, manufacturer's specification sheet, or direct metering. This demand is multiplied by hours or operations determined through sampling, surveys, or best practice. These data are multiplied by the relevant emission factors.

For the mobile homes approach, applicable only to category D, the project emissions are determined through best practice heat load modeling of the replacement home. These data are multiplied by the relevant energy contents and emission factors for each energy type to quantify project emissions.

All formulae and quantification methods were reviewed for accuracy and appropriateness. First Environment concluded that the Methodology Element's approach to calculate project emissions is appropriate and adequate.

Emission Reductions Quantification

Emission reductions are calculated through equations that are algebraically equivalent to subtracting project emissions and leakage emissions from baseline emissions.

All formulae and quantification methods were reviewed for accuracy and appropriateness. First Environment concluded that the Methodology Element's approach to calculate emission reductions is appropriate and adequate.

3.6 Leakage

The proposed Methodology Element accounts for leakage emissions from improperly disposed of appliances, heating and cooling equipment, and/or mobile homes. These leakage emissions include CO_2 emissions from continued operation of replaced appliances, heating/cooling equipment, and/or mobile homes and HFC emissions from improper disposal of refrigerators or air conditioners. Leakage emissions are calculated using methods similar to those described in Section 3.5 above.

Over the course of the validation, MaineHousing demonstrated that it had considered other potentially significant leakages, such as upstream emissions from transportation during weatherization and material production, and justified their exclusion. First Environment determined that approach to quantifying leakage in the proposed Methodology Element is appropriate and adequate.

3.7 Monitoring

All data and parameters required for emissions quantification are described and appropriately defined in the proposed Methodology Element. The proposed Methodology Element requires all measurements to be taken in accordance with industry best practices with appropriate frequency. The proposed Methodology Elements provides several options for quantifying emissions reductions, as discussed above in Section 3.5 of this report. Monitoring for the project consists of several approaches that can include conducting best practice energy audits and energy modeling, collecting electricity and fuel invoices, and conducting sampling. When sampling, the proposed Methodology Element requires that the sampling size be determined based on an equation taken from the IAF Guidance on the Application of ISO/IEC Guide 66 (IAF GD6:2006).

First Environment determined that the monitoring approach is appropriate and adequate to obtain the necessary data for emission reductions quantification.

3.8 Data and Parameters

The proposed Methodology Element describes parameters required for emissions quantification and lists them in tables that include a description of the parameter, the unit for the parameter,

the source of the data to be monitored, and the frequency with which the parameter should be monitored. The proposed Methodology Element requires electricity emission factors be obtained from a regulated source or through the use of the most recent CDM "Tool to calculated emission factor for an electricity system. Data for the ECF must be obtained from a recognized national authority, and heating and cooling degree data must be obtained from reputable regional or national meteorological organizations. Generally, standards and factors are required to be obtained from publicly available, reputable, and recognized sources.

During the course of the validation, MaineHousing provided detailed descriptions of the safeguards taken to mitigate uncertainty with data and parameters related to data management, outside data, projections, and statistics. This mitigation includes training requirements for energy auditors, use of outside data from only credible sources, establishment quality assurance procedures in the proposed Methodology Element, and requirements that sampling meets sample size requirements based on IAF Guidance on the Application of ISO/IEC Guide 66 (IAF GD6:2006).

First Environment concluded that the data and parameters included in the proposed Methodology Element and the associated requirements for measurement and monitoring are appropriate and sufficient to reduce uncertainty in emission reduction calculations.

3.9 Adherence to the Project-Level Principles of the VCS Program

The proposed Methodology Element was developed in accordance with the requirements of VCS 2007.1 and adequately addresses the principles of relevance, completeness, consistency, accuracy, transparency, and conservativeness.

3.10 Comments by Stakeholders

In accordance with VCS requirement, a 30-day public stakeholder consultation was conducted from January 20, 2010 – February 18, 2010. Three stakeholder comments were received for the proposed Methodology Element including comments from the Center for Resource Solutions, the National Energy Assistance Director's Association, and Global Climate Strategies. MaineHousing's responded to all comments submitted through letters to the commenters, which were provided to First Environment during the validation. Through these responses, MaineHousing demonstrated how it has taken due account of all comments submitted. The comments and MaineHousing's responses are summarized in the table below.

Commenter	Summary of Comment	Summary of Response	Determination
Center for Resource Solutions	This Methodology Element in its current form allows for double counting, and certain energy efficiency measures under the proposal will not result in any real reductions in GHG emissions due to the presence of a cap and trade on CO_2 emissions in Maine. CRS recommends that the Methodology Element be limited to only include emission reductions from efficiency measures outside of electricity consumption, such as measures that will result in reduced natural gas consumption for central heating.	This issue is addressed in the VCS rules, including VCS 2007.1 Section 5.2.2, which specifically prohibits double counting. Since this Methodology Element is being validated according to VCS rules, any resulting project would be a VCS project and would be required to address the double counting issue prior to being validated.	Response is adequate.
The National Energy Assistance Directors Association (NEADA).	Supportive comments urging VCS to work with Maine State Housing Authority to validate this much needed Methodology Element.	Thank you for the supportive comment.	Response is adequate.
Global Climate Strategies	Request for clarity as to the applicability of such items as load controllers on major load baring devices and smart thermostats enabled with features like 2 way communication and mesh networking as applicable to energy efficient measures or efficiency enhancements.	If the technology directly reduces the consumption of energy due to an efficiency improvement to the building envelope, central heating system, or the replacement of an appliance, the technology is eligible. Technologies, such as load controllers that simply shift demand without reducing consumption, would not be considered eligible.	Response is adequate.

4 Assessment Conclusion

First Environment performed the Methodology Element validation assessment of the proposed Methodology Element as part of the VCS double-approval process. First Environment used the Voluntary Carbon Standard 2007.1 and the VCS Program Normative Guidance Document: Double Approval Process, Version 1.0 as the assessment criteria and to guide the Methodology Element validation assessment process. The proposed Methodology Element belongs to Sectoral Scope 3 – Energy demand.

The review of the proposed Methodology Element and the satisfaction of corrective action and clarification requests have provided First Environment with sufficient evidence to determine the fulfillment of stated criteria.

In summary, it is First Environment's opinion that the proposed Methodology Element entitled *Methodology for Weatherization of Single and Multi-Family Buildings* Version 3.2 dated June 28, 2010, meets all relevant VCS requirements.

In November 2010, First Environment was provided with a revised version of the methodology as result of changes made during the second validation assessment. As the first validator of the methodology, we support the changes resulting from the second validation and specifically the methodology Version 3.6 dated November 24, 2010.

This validation is based on information made available to us during the validation process. First Environment cannot guarantee the accuracy or correctness of this information. Hence, First Environment cannot be held liable by any party for decisions made or not made based on the report or opinion.

5 Eligibility Criteria For Validator

First Environment has not completed 10 validations in the VCS Sectoral Scope 3 – Energy Demand and therefore cannot independently fulfill the requirements of 4.7.3 of the VCS Program Normative Document: Double Approval Process, Version 1.0.

6 Lead Validator Signature

Keith Dennis
Associate

7 Internal Reviewer Signature

James T. Wintergreen
Senior Associate