REPORT OF THE SECOND METHODOLOGICAL ASSESSMENT FOR THE PROPOSED METHODOLOGY: *GHG EMISSION* REDUCTIONS *THROUGH CARPOOLING*.

REPORT N°: VCSM-14-001

Document Prepared By:

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Summary:

The Assessment team performed the methodology assessment of the New Proposed VCS methodology: "GHG Emission Reductions Through Carpooling" version 2.0 on the basis of the Verified Carbon Standard requirements stated on Methodology Approval Process (versin 3.5), VCS Program Guide (version 3.5), VCS Standard (version 3.4) and VCS Validation Verification Manual, (version 3.1_1).

The *GHG Emission Reductions Through Carpooling* Methodology (proposed VCS new methodology), under assessment, features a set of procedures related to the quantification of GHG emissions avoided thanks to car pooling commuting; these emissions are associated to CO_2 emissions avoided through carpooling commuting and therefore, avoidance of single-occupancy of cars and increasing transportation efficiency. *Greenmiles Technologies*, hereafter referred to as "Methodology Developer", *LLC* is responsible for the development of the new proposed methodology, the one has been developed under the Voluntary Carbon Standard (VCS) framework

When carrying out the assessment of the methodology "GHG Emission Reductions Through Carpooling", the assessment team raised a total of 6 findings were raised: 0 Cars and 6 CLs.

It is the opinion of the assessment team that the proposed methodology satisfies VCS requirements in terms of its clarity, relevance and compliance.

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1 INTRODUCTION

1.1 Objective

The purpose of the methodology assessment conducted by the assessment team from ICONTEC, is to determine compliance of the new proposed methodology with requirements stated on the Verified Carbon Standard (VCS) requirements framework including: the Verified Carbon Standard requirements stated on Methodology Approval Process (version 3.5), VCS Program Guide (version 3.5), VCS Standard (version 3.4) and VCS Validation Verification Manual, (version 3.1.1).

1.2 Summary Description of the Methodology

The proposed Methodology was developed by its *Methodology Developer* in order to provide guidance and procedures on the matters of GHG emissions avoidance thanks to carpooling and vanpooling systems. These emissions avoided are quantified as CO_2. In turn, carpooling and vanpooling is understood as the action of sharing transportation means and the subsequent avoidance of single-occupancy car trips.

Baseline emissions relevant to project activities applying the proposed new methodology are quantified thanks to single occupancy vehicular trips that would have taken place in absence of the carpool. Concerning the baseline quantification, the proposed methodology requires those being part of the carpooling system to be part of the Carpool management and monitoring system (CMMS).

On the other hand, project emissions are quantified by determining the actual fuel consumed by the carpools and vanpools related to project activities. For its part, fuel consumption is determined either through the Carpool Management Application CMA monitoring parameters from vehicle engine control unit (ECU) over OBDII dongle, or Carpool Management Application CMA monitoring parameters for trip distance combined with manufacturer or government published fuel economy statistics.

Finally, leakage is the product of those GHG emissions not taken into account in the boundary of the project activities. Emission reductions quantification is based upon data derived from carpooling community and requires the acquisition of a Carpool Management Application (CMA), the one will provide information on the matters of trips and occupancy.

2 ASSESSMENT APPROACH

2.1 Method and Criteria

In accordance with VCS rules, this assessment is carried out applying standard auditing techniques in order to determine correctness and completeness of the new proposed

methodology. Additionally, the methodology assessment encompasses applicability conditions, project boundary, procedure for demonstrating additionality, procedure for determining baseline scenario, baseline emissions, leakage, quantification of net GHG emission reduction and/or removals, monitoring, data and parameters, and relationships to approved or pending methodologies.

The methodology assessment was also performed following mandatory VCS requirements proposed on:

- VCS Standard
- VCS Methodology Approval Process
- VCS Methodology Templates
- VCS Validation and Verification Manual

Finally, the assessment team performed the assessment of the new proposed methodology against the most recent version of the relevant VCS guidance documents.

2.2 Document Review

As part of the assessment process, the assessment team carried out a detailed review of the methodology element against criteria of the guidance documents previously listed within this report. The A desk review undertaken did involve but was not limited to the following documents:

- VCS requirements described in section 2.1 of this report.
- GHG Emission Reductions through Carpooling, new proposed methodology. File issued by Greenmiles Technologies LLC dated on 24-October-2013. File name: *VCS Methodology Carpool v1.3 +VCS_st.doc*
- GHG Emission Reductions through Carpooling, new proposed methodology. File issued by Greenmiles Technologies LLC dated on 24-October-2013. File name: *VCS Methodology Carpool v2.0.doc*
- GHG Emission Reductions through Carpooling, new proposed methodology. File issued by Greenmiles Technologies LLC dated on 24-October-2013. File name: *VCS Methodology Carpool v2.01.doc*[1]

[1] Final version reviews by the assessment team

In addition, the proposed methodology was assessed for logical coherence, internal consistency, completeness, and consistency with current best practices for quantification of emission reduction and removals. Following documents have been taken into account in order to carry out the desk review stage.

2.3 Interviews

The assessment team did not find it necessary to conduct any formal interviews other than discussions with the Methodology developers (Greenmiles Technologies, LLC). Taking into account expertise form the lead auditor and technical expert, doubts and findings were solved by interviewing Mr. Sohil Thakkar in two opportunities: on the 29th of March 2014 and the 5th of April 2014

2.4 Assessment Team

Table1: Assessment Team

Role/Qualification	Full Name	Country	Type of involvement			
			Desk review	Interviews	Reporting	Technical Review
Lead Auditor	Jacobo Carrizales	Colombia	**X**	**X**	**X**	
Technical Expert	Jhonny Leon	Colombia	**X**	**X**	**X**	
Technical reviewer	Cristian Grisales	Colombia				**X**

Table2: Assessment Team Experience

Role/Qualification		Expertise/Experience
Lead Auditor	**Jacobo Carrizales**	**Lead auditor of the CDM projects:** *Verification of Monomeros nitrous oxide abatement project, Colombia* *Validation of Thuan Nhien PhongWind Farm, Viet Nam* *Validation of Phuong Mai 3 Wind Power Project, Viet Nam* *Verification of MIO Cali, Colombia* *Verification of BRT Bogotá, Colombia: TransMilenio Phase II to IV* *Verification of BRT Macrobus Guadalajara, Mexico* *Validation of SHPs Tambaú, das Pedras and Rio do Sapo CDM Project (JUN1132), Brazil* *Validation of SHPs Poço Fundo and Providência CDM Project (JUN1133), Brazil*
		Technical expert of the CDM projects: *Validation of CGR Catanduva Landfill Gas Project, Brazil* *Verification of Macaubas Landfill Gas Project, Brazil* *Verification of Ciudad Juarez Landfill Gas to Energy Project, México*
		Technical reviwer of the CDM projects: *Verification of BRASCARBON Methane Recovery Project BCA-BRA-02, Brazil* *Verification of BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil* *Verification of BRASCARBON Methane Recovery Project BCA-BRA-05, Brazil* *Verification of BRASCARBON Methane Recovery Project BCA-BRA-07, Brazil* *Verification of BRASCARBON Methane Recovery Project BCA-BRA-08, Brazil* *Verification of Biogas energy plant from palm oil mill effluent, Guatemala* *Verification of Co-composting of EFB and POME project, Guatemala* *Validation VCS of BRASCARBON Methane Recovery Project BCA-BRA-02, Brazil*

		Validation VCS of BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil *Validation VCS of BRASCARBON Methane Recovery Project BCA-BRA-05, Brazil* *Validation VCS of BRASCARBON Methane Recovery Project BCA-BRA-07, Brazil* *Validation VCS of BRASCARBON Methane Recovery Project BCA-BRA-08, Brazil* *Verification VCS of BRASCARBON Methane Recovery Project BCA-BRA-02, Brazil* *Verification VCS of BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil* *Verification VCS of BRASCARBON Methane Recovery Project BCA-BRA-05, Brazil* *Verification VCS of BRASCARBON Methane Recovery Project BCA-BRA-07, Brazil* *Verification VCS of BRASCARBON Methane Recovery Project BCA-BRA-08, Brazil*
Technical Expert	**Jhonny Leon**	**Technical Expert of the CDM projects:** *Validation of EKO Electric Vehicles, India* *Validation of Electrotherm Electric Vehicles, India* *Validation of Hero Electric Vehicles, India* *Validation of Lohia Auto Industries Electric Vehicles, India* *Verification of BRT Chongqing Lines 1-4, China* **Technical Reviwer of the CDM projects:** *Validation of Project LRT system in Tunis* *Verification of BRT Lines 1-5 EDOMEX, Mexico* *Verification of Metro Delhi, India* *Verification of BRT Zhengzhou, China* *Verification of MIO Cali, Colombia* *Verification of BRT Macrobus Guadalajara, Mexico*
Technical Reviewer	**Cristian Grisales**	**Auditor and Technical Expert of the CDM projects:** *Validation of Biogas project, Olmeca I, Santa Rosa, Guatemala* *Validation of CGR Catanduva Landfill Gas Project, Brazil* *Validation of Macaubas Landfill Gas Project, Brazil* *Validation of Taurichuco Hydropower Project, Perú* *Validation of Teresina Landfill Gas Project, Brazil* *Validation of Maceio Landfill Gas Project, Brazil* *Validation of Doña Teresa Hydroelectric Power Plant, Colombia* *Validation of SHPs Poço Fundo and Providência CDM Project (JUN1133), Brazil* *Validation of SHPs Tambaú, das Pedras and Rio do Sapo CDM Project (JUN1132), Brazil* *Verification of Amaime Minor Hydroelectric Power Plant, Colombia* *Verification of Ciudad Juarez Landfill Gas to Energy Project, Mexico* *Verification of Santa Ana Hydroelectric Plant, Colombia* *Verification of Biogas Project, Olmeca III, Tecún Uman, Guatemala* *Verification of Berlin Geothermal Project, Phase Two, San Salvador*
		Technical Reviwer of the CDM projects: *Validation of Thuan Nhien and Wind Farm, Vietnam* *Validation of Phuong Mai 3 Wind Power Project, Vietnam* *Validation of Chamelecón 280 Hydroelectric project, Honduras* *Validation of Providencia I: 1.8MW Small Hydro Power Generation Plant, Colombia* *Validation of Providencia III: 9.11MW Small Hydro Power Generation Plant,Colombia* *Validation of SHP Itaguacu CDM Project (JUN 1146), Brazil* *Renewal of Aguafresca Multipurpose and Environmental Service Project, Colombia* *Validation of Feira de Santana Landfill Gas Project, Brazil* *Validation of SHP Morro Azul CDM Project (JUN1164), Colombia* *Verification of Santa Ana Hydroelectric Plant, Colombia* *Verification of Methane recovery and effective use of power generation project Norte III-B Landfill, Argentina*

2.5 Resolution of Findings

All of the Findings raised by the assessment team (please refer to tables 1 and 2 for description of the audit team), were catalogued as *Clarifications* (CL), either because it was missing information or information provided was not enough in order to fully understand methodological concerns.

A total of 6 *Clarifications* (CL) were raised. These findings were successfully closed once the Methodology Developer provided enough information and addressed raised findings through changes on the *VCS Methodology Template* relative to the new proposed methodology Findings are summarized on table A-1 from Appendix 1. .

3 ASSESSMENT FINDINGS

The assessment team performed two different interviews with Mr Sohil Thakkar (team member of Greenmiles Technologies, LLC -please refer to section 2.3-), as a mean to discuss methodological issues and as part of the standard audit techniques carried out for the assessment process.

Main points of discussion treated through findings were related to methodological assumptions, monitoring procedures and integration of the 30-day public consultation period comment. Additionally, findings were sent to the Methodology Developer on the 13th of May 2014, being answered on the 20th of May; answers included changes on the latest version of the methodology[2]. Finding **CL 2** was assessed once again since QA/QC procedures were not define for parameter *i* (CMMS assigned unique identifier for a member), nevertheless once the methodology developer provided due explanations on the matter, finding was successfully closed.

Finally, findings fruit of the assessment process are entirely described on table A-1 from Appendix 1 further in this assessment report. Table A-1 includes raised finding, methodology developer, answers and assessment team conclusion. All of the findings raised by the assessment team were successfully closed. In addition, conclusion related to closure of findings has been fully presents as well on table A-1 from Appendix 1.

The assessment team verified that principles set out in the VCS Standard are an integral part of the new proposed methodology, furthermore the assessment team including the technical expert, agrees with the methodological approach of the new proposed methodology.

3.1 Relationship to Approved or Pending Methodologies

[2] Final version: 2.01, file name: *VCS Methodology Carpool v2.01.doc*

In accordance with the VCS Methodology Approval Process the assessment team found that, by the time this report has been released neither VCS methodologies nor CDM methodologies specifically and entirely refer to methods or procedures developed to determine emission reductions trough carpooling. Furthermore, the assessment team determined that existing initiatives for quantification of emission reductions through carpooling are promoted by local governments such as the Portuguese government[3].

On the other hand, the methodology developer correctly listed similar approved methodologies from VCS and DCM schemes. On table 3 as follows methodologies have been listed and comments from the assessment team summarized

Table 3. Methodologies Assessed As Similar to the New Proposed Methodology

Methodology and Title	Origin	Comment / Conclusion
Pending: Methodology for Determining GHG Emission Reductions Through Bicycle Sharing Projects	VCS	The methodology refers to bicycle sharing not to sharing trips by carpooling. Methodology not similar to the new proposed methodology
VM0019: Fuel Switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets, v1.0	VCS	Fuel switching is not a core element of the new proposed methodology. Not considered suitable to replace the new proposed methodology
VM0020: Transport Energy Efficiency from Lightweight Pallets	VCS	Lightweight Pallets are not even considered as part of the new proposed methodology. Not considered suitable to replace the new proposed methodology
VMR0004: Revisions to AMS-III.BC to Include Mobile Machinery, v1.0	VCS	Carpooling is a specific concept involving passenger cars or vans to be consider as carpooling. Not considered suitable to replace the new proposed methodology
NM0364, Pending: Rail Methodology	CDM	Not applicable since refers to Rail transportation means. Not considered suitable to replace the new proposed methodology
ACM0016: Mass Rapid Transit Projects --- Version 3.0.0	CDM	Not applicable since refers to Mass Rapid Transit ttransportation means, no carpooling. Not considered suitable to replace the new proposed methodology
AM0031: Bus rapid transit projects --- Version 5.0.0	CDM	Not applicable since refers to Bus transportation means. Not considered suitable to replace the new proposed methodology
AM0090: Modal shift in transportation of cargo from road transportation to water or rail transportation --- Version 1.1.0	CDM	No carpooling involved at all when considering modal shifts. Not suitable to replace the new proposed methodology

[3] Information available on the website: file:///C:/Users/jcarrizales/Desktop/a_structured_simulation-based_methodology_for_carpooling_viability_assessment.pdf

AM0101: High speed passenger rail systems --- Version 1.0.0	CDM	Not applicable since refers to Rail transportation means. Not considered suitable to replace the new proposed methodology
AM0110: Modal shift in transportation of liquid fuels --- Version 1.0.0	CDM	Not considered suitable to replace the new proposed methodology,
AMS-III.AA.: Transportation Energy Efficiency Activities using Retrofit Technologies --- Version 1.0	CDM	No retrofit involved on carpooling, therefore is not considered suitable to replace the new proposed methodology
AMS-III.AK.: Biodiesel production and use for transport applications --- Version 1.0	CDM	Fuel is just one of the components of the new proposed methodology; there is no consideration to carpooling on the approved methodology.
AMS-III.AP.: Transport energy efficiency activities using post - fit Idling Stop device --- Version 2.0	CDM	This methodology does not match the project activity circumstances. Not considered suitable to replace the new proposed methodology
AMS-III.AQ: Introduction of Bio-CNG in transportation applications --- Version 1.0	CDM	Not considered suitable to replace the new proposed methodology since does not involve carpooling.
AMS-III.AT.: Transportation energy efficiency activities installing digital tachograph systems to commercial freight transport fleets --- Version 2.0	CDM	This methodology refers to commercial freight transport, therefore not to carpooling. Not considered suitable to replace the new proposed methodology
AMS-III.AY.: Introduction of LNG buses to existing and new bus routes --- Version 1.0	CDM	Not considered suitable to replace the new proposed methodology
AMS-III.BC.: Emission reductions through improved efficiency of vehicle fleets --- Version 1.0	CDM	This methodology refers to commercial vehicle fleets. Not considered suitable to replace the new proposed methodology
AMS-III.C.: Emission reductions by electric and hybrid vehicles --- Version 13.0	CDM	Core aspects of this methodology do not refer to carpooling. Not considered suitable to replace the new proposed methodology
AMS-III.S: Introduction of low-emission vehicles/technologies to commercial vehicle fleets --- Version 4.0	CDM	Core aspects of this methodology do not refer to carpooling. Not considered suitable to replace the new proposed methodology
AMS-III.T.: Plant oil production and use for transport applications --- Version 2.0	CDM	Carpooling has not been considered as a core issue for this methodology. Not considered suitable to replace the new proposed methodology
AMS-III.U.: Cable Cars for Mass Rapid Transit System (MRTS) --- Version 1.0	CDM	Methodology refers to different transportation means. Not considered suitable to replace the new proposed methodology

3.2 Stakeholder Comments

New proposed methodology was subject of a public comment period from the 23[d] of October to the 23[d] of November 2013, being generated one comment from this exercise[4]. The assessment team considered necessary to raise a Clarification (**CL 5**) in order to ask methodology developer how existing comment was taken into account. Once methodology developer identified modification on the latest methodology version, version 2.01, the assessment team verified inclusion of equations 3 and 4 as a result of thee comment.

3.3 Structure and Clarity of Methodology

The new proposed methodology "GHG EMISSION REDUCTIONS THROUGH CARPOOLING" was reviewed by the assessment team for clarity and logical consistency in accordance with VCS rules for methodology assessments, and technical criteria, Also, terminology used in the revised methodology element is consistent with the VCS Program and GHG accounting and language.

Terms, definitions, key words and templates usage is adequate and consistent with the VCS framework, Nevertheless, Methodology developer was asked to double check spelling mistakes through **CL 6**. This finding was closed once mistakes were corrected and therefore, overall clarity improved.

3.4 Definitions

All Key terms defined in the new proposed methodology are presented in a clear and appropriate manner in section 3 of the correct template. In addition, methodology developer has listed relevant terms in order to increase overall clarity of the proposed methodology. Finally dedicate acronyms list has been included as the assessment team verified.

3.5 Applicability Conditions

The new proposed methodology specifically describes the clear conditions and parameters to apply (Carpool locations, carpool members and carpool vehicles), according to the VCS rules and requirements. Applicability conditions and their assessment are summarized on table 4 as follows:

[4] Comment available on the website: http://www.v-c-s.org/sites/v-c-s.org/files/methodology_comment_docs/Carpooling%20comment.pdf

Table 4. Applicability conditions assessment.

Applicability Criterion		Validation Remark
Each commuter carpool must take place within (one of) the carpool Community Area(s) defined in the project description.		The applicability criteria mentioned for the commuter in order to participate in the project activities applying the proposed methodology, in a defined carpool Community Area(s), is reasonable and would lead to a more accurate quantification of GHG emission reduction.
The carpool Community Area(s) must be located in regions where vehicles with on-board diagnostic interface (OBDII) are commonplace. These regions include North America, Europe, Japan and Australia at the time of publication.		Liaison between carpool Community Area(s) locations and availability of OBDII is not just logical and correctly but necessary. Also, appropriately included by the methodology developer in the context of methodological procedures.
All carpool vehicles must support OBDII interface.		This condition has been correctly remarked as indispensable in order to apply the new proposed methodology
Each carpool member must register with the CMMS and be uniquely identified via smart phone identity (MEI and/or phone number)		Unique identification is one of the key issues of the monitoring system, its implementation will allow to correctly quantify (and therefore monitor) commuters trips as a mean to determine emission reductions.
Each carpool member must own a private vehicle that is available for commute and register that vehicle with the CMMS.		When owning vehicles, carpooling community warranties correctness on monitoring procedures as well as correctness in emission reduction quantifications
Each carpool member must carry their Smartphone and run CMA on all carpool trips for emission		Emission reductions quantification relies on electronic monitoring of trips through smartphones, therefore special attention has to be put in terms of a dully CDMA Smartphone application
The methodology is not applicable under the following condition:	A carpool member for whom baseline transport mode (as describe later) is not a carpool or drive alone.	Non-Applicability conditions clearly define the actual scope of the methodology as well as monitoring issues that could be present in future scenarios.
	A carpool trip where the carpool vehicle's monitoring system is not functioning properly (e.g., has the check engine light on) or the carpool vehicle does not have the OBDII dongle attached to its OBD port is not eligible to be included in the quantification of emission reductions	

In summary, the applicability conditions are appropriate, adequate and in compliance with the VCS rules. Project

3.6 Project Boundary

Project Boundary was defined by the new proposed methodology as the "Community Area of coverage and the participating carpool members". This approach, taken into account when identifying project boundary by the methodology developer, has been correctly addressed and is appropriate for the project activities using the new proposed methodology.

Additionally, GHG sources and gases included are adequate when considering future project activities scenarios. CO_2 has been identified as the main gas to be considered according to defined sources, exclusion of NH_4, N_2O and other GHGs is according to gases taken into account by different methodologies of the transport sector.

In summary, the actual definition of the project boundary and sources and types of GHGs included are appropriate, adequate and in compliance with the VCS rules and requirements.

3.7 Baseline Scenario

According to the VCS rules and requirements, there are procedures for determining the baseline scenario taking into account existing and alternative project types as well as activities and technologies that provide the same type of quality and quantity of service as the project activity. In this framework the baseline scenario has been defined by the Methodology Developer as: "*Baseline emissions are quantified based upon the single-occupancy vehicular trips that would have taken place in absence of the carpool, based on carpooling members' vehicle and trip information registered with the Carpool management and monitoring system (CMMS)*". The assessment team verified this methodological assumption is widely used for methodologies involving transport sector.

On the matters of the Baseline Scenario determination, the new proposed methodology establishes a minimum amiability of information related to:

i. *Commuting modes used in last 12 months assuming current work and resident address for last 12 month for spring, summer, fall and winter months (March-May, June-Aug, Sept-Nov, Dec-Feb respectively):*
   a. *On average, number of (fractional) days per week drive alone to work*
   b. *On average, number of (fractional) days per week carpooled to work*
   c. *On average, number of (fractional) days per week used alternative transport mode –public transit, taxicab, walking, bicycling and motorcycle – to work.*
   d. *On average, number of (fractional) days per week worked from home*
ii. *Register, and confirm biennially and keep up-to date SOBT vehicle.*
iii. *Register, and confirm biennially and keep up to date resident and work address.*

In turn, once this information has been provided, the Baseline determination is done thanks to CMMS (according to the methodology developer), which: "determines baseline transport mode for a carpool member" though procedure as follows:

1. *Determine PCC & BEQC for the carpool member as follows:*

- $PCC_i = \frac{\sum_m c_{i,m}}{20}$ [5]

[5] Equation number 1 of the new proposed methodology

- $BEQC_i = \frac{\sum_m S_{i,m}6}{20}$

Where:

m *: Season identifier – spring, summer, fall & winter*

i *: Individual carpool member identifier*

$S_{i,m}$ *: Number of days per 5-day week a carpool member* i *drive alone during seasons* m

$C_{i,m}$ *: Number of days per 5-day week a carpool member* i *carpool during seasons* m

PCC_i *: Pre-program carpooling co-efficient of a carpool member* i

$BEQC_i$ *: Baseline Emission quantification co-efficient of a carpool member* i

2. *If alternative transport mode is available and travel time with alternative transport mode is no more than 15 minutes longer compared to drive alone as determined using mapping software like Google MAP, the member baseline transport mode is alternative transport mode. (These members are not expected to switch their commute mode to carpool because of the project activity). The baseline emissions for such carpool members are not eligible to be included in the quantification of emission reductions and must conservatively be set to zero.*
3. *If carpool member doesn't register SOBT vehicle or doesn't own one, the member baseline transport mode is assumed to be alternative transport mode. The baseline emissions for such carpool members are not eligible to be included in the quantification of emission reductions and must conservatively be set to zero.*
4. *If member's BEQC is less than 0.2, than member's baseline transport mode is set to work from home. The baseline emissions for such carpool members are not eligible to be included in the quantification of emission reductions and must conservatively be set to zero.*
5. *If member's BEQC is greater than or equal to PCC, than member's baseline transport mode is drive-alone.*
6. *If member's PCC is greater than BEQC, than member's baseline transport mode is carpooling.*

When following previously described procedure, the baseline of a project activity is determined. Taking into account the future tentative project activities, information requirements are suitable enough to determine baseline, as well as procedures to determine PCC and BEQC. The methodology developer further establish that commuters using alternative transportation means: "*travel time with alternative transport mode is no more than 15 minutes longer compared to drive alone as determined using mapping software like Google MAP*", are not eligible for quantification of emission reductions.

In summary, the assessment team verified procedures and methodological assumptions, for determining the baseline scenario, finding accuracy and completeness in terms of the

[6] Equation number 2 of the new proposed methodology

VCS rules and requirements. Finally the baseline quantification is logic, and suitable for project activities applying the new proposed methodology.

3.8 Additionality

The methodology element uses a project method for the demonstration of additionality. Procedure defined by the methodology developer is a three steeps based procedure, Regulatory Surplus, Implementation Barriers (Investment barrier, Technological barrier, and Institutional barrier) and common practice analysis as described as follows:

Step 1: Regulatory Surplus. Consists of a detailed legislation and policy review (including each and every regulatory framework), in order to determine that no compulsory legal requirement is the main reason for developing the project activities related to carpooling.

Once no policy or legal compulsory requirement has been found, Step 2 can be followed. The assessment team agrees with the first step to determine additionality. Furthermore, the step is aligned with the VCS rules and Requirements as well as CDM rules and requirements.

Step 2: Implementation Barriers. Methodology developer has considered three different barriers: Investment (limited sources of revenue mean the project is not financially attractive), Technology (appropriate computer and/or Smartphone applications do not exist to allow users to manage their carpools) and Implementation (limited inherent interest in the project from individuals or companies due to low desirability of carpooling). Along with procedure previously described, Step 2 defines procedures to be applied when project activities seeking to demonstrate technological and/or institutional barriers mitigated by the project:

1. Technology to simplify carpool formation (e.g., providing matching between rider and driver).
2. Activities to encourage carpooling among commuters (e.g., employer providing special parking spot for the carpool vehicle).
3. If baseline transportation mode of a carpool member is alternative transport mode or work from home, than member's activity is not additional.
4. If baseline transportation mode of a carpool member is carpool which is also a carpool, than member's activity is not additional.
5. If baseline transportation mode of a carpool member is carpool and PCC of the member is greater than or equal to 0.8, member's activity is not additional.
6. Member must (self) certify during registration process that carpool management and monitoring system (CMMS) removed technology/institutional barrier by providing at least one of the following to enable him/her to do carpooling:
    a. Find another carpool member

b. Track carpooling activity on member's behalf for the benefit of the member
c. As a passenger, removed concerned about ride back home in some way.
d. Incentives carpooling behaviour (by tracking carpool cost, facilitating automatic financial transaction between carpool member accounts, etc).

The assessment team verified the approach used by the methodology developer is in accordance not just with the VCS rules and Requirements but, it is in accordance with the CDM framework for determining barriers.

Step 2: Common Practice: The last step form the three step approach is the common practice analysis. Methodology developer added a common practice analysis to be taken into consideration; this analysis is based upon the *Herfindahl index*.

Herfindahl index is a statistical tool for determining concentration[7] and for the purpose of the methodology to determine competition that exists within a market or industry[8]. In this sense, the common practice analysis was understood as a mean to determine occurrence of carpooling within a determined geographical area.

As part of the validation assessment process for a new methodology, the 30-day public consultation period registered just a comment; this comment is related to the common practice analysis[9]. The assessment team raised **CL 5** concerning registered comment. The methodology developer included equation number 3 as follows, in order to properly explain the common practice analysis:

$$HHI = \sum M_k^2$$

The assessment team found consistency in the common practice analysis, referring to VCS rules and Requirements. Rationality of the methodological assumptions for determining Common practice are accurate, as well as its calculation procedure. On the matters of geographical boundary, it will depend on the actual boundary of the project activity applying the new proposed methodology.

The assessment team was able to verify that additionality analysis provide a step-wise approach to demonstrate whether a project activity would have occurred in the absence of the intervention of the carbon market, complying at the same time with VCS rules and requirements on the matters of project methods. .

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[7] Fed. Res. Bull. 188 (1993), available on the website: http://heinonline.org/HOL/LandingPage?handle=hein.journals/fedred79&div=37&id=&page=

[8] http://www.modernanalyst.com/Careers/InterviewQuestions/tabid/128/articleType/ArticleView/articleId/1003/What-is-the-Herfindahl-Hirschman-Index-HHI-and-why-would-you-use-it.aspx

[9] http://www.v-c-s.org/sites/v-c-s.org/files/methodology_comment_docs/Carpooling%20comment.pdf

3.9 Quantification of GHG Emission Reductions and Removals

3.9.1 Baseline Emissions

According to the methodology developer, procedure established in order to quantify the actual Baseline Emission, has been taken into account: "In absence of the carpool trip, it is assumed that each member of the carpool would have taken an individual, single-occupancy trip from their registered origin location to their registered final destination location". In this sense, methodology proposes the use of three equations, number 5, 6 and 7 as follows:

$$N_{y,t} = \bigcup_{j \in S_{y,t}} N_j$$

Equation number 5.

Where:

$N_{y,t}$: Membership set of a carpool associated with the carpool trip t in year y.

$S_{y,t}$: Set of carpool sub-trips in the carpool trip t in year y.

N_j : Carpool sub-trip j membership set (e.g, set of occupants i on sub-trip j)

j : Particular carpool sub-trip identifier.

i : Individual carpool member identifier who travelled in trip t in year y.

$$BE_{i,\acute{c}} = \begin{cases} D_i \cdot W_{\acute{c}} \cdot GE_p & \tau(\acute{c}) = PEV \\ D_i \cdot V_{\acute{c}} \cdot EF_{f(c)} & \tau(\acute{c}) = FFV, g_V(\acute{c}) = 0 \\ D_i \cdot \hat{V}_{\acute{c}} \cdot EF_{f(c)} & \tau(\acute{c}) = FFV, g_V(\acute{c}) = 1 \\ max(0, D_i - R_{\acute{c}}) \cdot V_{\acute{c}} \cdot EF_{f(c)} + min(D_i, R_{\acute{c}}) \cdot W_{\acute{c}} \cdot GE_p & \tau(\acute{c}) = PHEV, g_V(\acute{c}) = 0 \\ max(0, D_i - R_{\acute{c}}) \cdot \hat{V}_{\acute{c}} \cdot EF_{f(c)} + min(D_i, R_{\acute{c}}) \cdot W_{\acute{c}} \cdot GE_p & \tau(\acute{c}) = PHEV, g_V(\acute{c}) = 1 \end{cases}$$

Equation number 6

Where:

i = Identifier for carpool member.

D_i = SOBT distance for carpool member i (km)

$BE_{i,\acute{c}}$ = Baseline emissions for carpool member i in SOBT vehicle $\acute{c}$ (tCO_2e)

$\hat{V}_{\acute{c}}$ = Measured average fossil fuel efficiency for SOBT vehicle $\acute{c}$ (L/km)

$V_{\acute{c}}$ = Vehicle fossil fuel efficiency for SOBT vehicle $\acute{c}$ (L/km)

$R_{\acute{c}}$: Vehicle all electric range for SOBT vehicle identified by VIN number $\acute{c}$, derived from manufacturer and/or government published fuel economy statistics (km).

$EF_{f(c)}$: GHG Emission factor of fuel used by vehicle identified by VIN number c. (tCO_2 /liter)

$W_{\acute{c}}$: Vehicle electric efficiency for SOBT vehicle identified by VIN number $\acute{c}$, derived from manufacturer and/or government published fuel economy statistics (KWh/km).

GE_p : Electricity generation GHG Emission factor corresponding to project geographic area p adjusted for transmission loss if any (tCO_2 /KWh)

$g_V(\acute{c})$: Indicator function for fossil fuel consumption measurement over OBDII interface enabled for SOBT vehicle identified by VIN number $\acute{c}$

The baseline emission for a carpool trip is determined as the "The baseline emission for a carpool trip t in year y is estimated as the summation of baseline emission for each carpool member *i* that participated in carpool trip *t* in year *y*" this methodology assumption is

supported with the equation number 7 of the new proposed methodology as described as follows:

$$BE_{y,t} = \sum_{i \in N_{y,t}} BEQC_i \cdot BE_{i,t}$$

Where:

$N_{y,t}$: Membership set of a carpool associated with the carpool trip t in year y

Once Baseline emissions for carpool member *i* in *SOBT* vehicle and the Baseline Emission Quantification Co-efficient is defined, the total amount of Baseline Emissions is calculated:

$$BE_y = \sum_{t \in T_y} BE_{y,t}$$

Equation number 8Where:

Where

T_y: Set of all carpool trips in year y

Methodological assumptions and calculation procedures were assessed by the assessment team, finding in summary that, all criteria and procedures described in this section to be clear, complete and conservative. The procedures for calculating baseline emissions are appropriate and are also in compliance with the VCS rules. The methodology developer included procedures for calculating baseline emissions included in the project. In addition All algorithms, equations and formulas used are appropriate and without error.

3.9.2 Project Emissions

Project emissions are the result of trips within the project boundary. According to the new proposed methodology, “The project emissions are calculated from monitored emissions from each carpool trip”. Calculation process has been defined thanks to equations 9, 10, 11 and 12 as follows:

$$PE_{j,c} = \begin{cases} d_j \cdot W_c \cdot GE_p & \tau(c) = PEV \\ d_j \cdot V_c \cdot EF_{f(c)} & \tau(c) = FFV, g_V(c) = 0 \\ FC_{j,c} \cdot EF_{f(c)} & \tau(c) = FFV, g_V(c) = 1 \\ FC_{j,c} \cdot EF_{f(c)} + min\left(d_j, \max(0, R_c - dd_{j,c})\right) \cdot W_c \cdot GE_p & \tau(c) = PHEV, g_V(c) = 1 \\ \left(\left(d_j - min\left(d_j, \max(0, R_c - dd_{j,c})\right)\right) \cdot V_c\right) \cdot EF_{f(c)} & \\ \quad + min\left(d_j, \max(0, R_c - dd_{j,c})\right) \cdot W_c \cdot GE_p & \tau(c) = PHEV, g_V(c) = 0 \end{cases}$$

Equation 9

Where:

j : Particular carpool sub-trip numerical identifier, assigned in a way so that this sub-trip identifier is greater than that of all sub-trips occurred before this sub-trip within this carpool

c : Vehicle identifier number (e.g, VIN number) of a carpool vehicle used in carpool sub-trip j

d_j : CMA measured travel distance of carpool sub-trip j. Distance is calculated using GPS and MAP feature of Smartphone the CMA is running on. (km)

W_c : Vehicle electric efficiency of a carpool vehicle identified by VIN number c, derived from manufactures and/or government publish fuel economy statistics (KWh/km).

$EF_{f\,(c)}$: GHG Emission factor of fuel used by vehicle identified by VIN number c,. (tCO_2/liter)

GE_p : Electricity generation GHG Emission factor corresponding to project geographic area p, adjusted for transmission loss if any (tCO_2 /KWh)

$PE_{j,c}$: Project emission for carpool sub-trip j in vehicle identified by VIN number c. (tCO_2)

$dd_{j,c}$: Cumulative distance travelled by a carpool vehicle c before sub-trip j within carpool trip t in year y

R_c : Vehicle all electric range of a carpool vehicle identified by VIN number c, derived from manufactures and/or government publish fuel economy statistics (km).

$\tau(c)$: Type of a carpool vehicle identified by VIN number c. (e.g., FFV, $PEV\ or\ PHEV$)

$FC_{j,c}$: Measured fuel consumption (or cubic feet for natural gas) over OBDII interface during carpool sub-trip j for a carpool vehicle identified by VIN number c.(litters)

V_c : Vehicle fossil fuel efficiency of a carpool vehicle identified by VIN number c, derived from manufactures and/or government publish fuel economy statistic (l/km).

$g_V(c)$: Indicator function indicating fossil fuel consumption measurement available for a carpool vehicle identified by VIN number c

Thanks to this equation (number 9 of the new proposed methodology), it is calculated the Project emissions for carpool sub-trip. As part of the Project Emissions determination, distance is found thanks to:

$$dd_{j,c} = \sum_{\{j:j\in S_{y,t} C(j)=c,\, j<j\}} d_j$$

Equation number 10

Where,

$C(j)$: VIN number of vehicle used in sub-trip j

Finally, once Project Emissions integrate trips and distance, Project Emissions from carpool trip are calculated as follows:

$$PE_{y,t} = \sum_{j\in S_{y,t}} PE_{j,c}$$

Equation 11

Equation 11 allows calculation of the "of project emissions for each carpool sub-trip *j* included in the carpool trip$t$" as a summation. When the project emissions due to carpool trip has been accounted, the total Project Emission in year "*y*" is calculated thanks to equation 12 of the new proposed methodology:

$$PE_y = \sum_{t\in T_y} PE_{y,t}$$

The assessment team found different procedures for calculating Project Emissions to be appropriate as well as to be in compliance with the VCS rules. The methodology

developer included procedures for calculating baseline emissions included in the project. In addition All algorithms, equations and formulas used are appropriate and without error.

3.9.3 Leakage

Leakage has been considered as "off-site generation of electricity for powering the central carpool server(s)", therefore these emissions will be beyond of the project boundary. The methodology developer proposed equation number 13 as a mean to calculate these leakage emissions:

$$LE_y = \sum EC_{CS} \cdot GE_p$$

Where,

LE_y : Leakage emissions (tCO_2)

EC_{CS} : Electricity consumption by the central carpools server(s) (kWh)

GE_p : Electricity generation GHG Emission factor of geographic area where the central carpool server(s) is located and is known, else geographic area of community area serviced by the carpool server. (tCO_2 /KWh)

The assessment team found assumptions, calculation procedure and algorithm used to describe the leakage emissions to be consistent with the VCS rules and requirements.

3.9.4 Net GHG Emission Reductions and Removals

Total emission reductions do to project activities using the new proposed methodology follows the general procedure for these kinds of calculations. The assessment team has had the chance to be part in several CDM validation and verification processes, finding similarities among the proposed methodological approach used by the project developer in equation number 13 and the CDM large scale and small scale methodologies:

$$LE_y = \sum EC_{CS} \cdot GE_p$$

Where,

LE_y : Leakage emissions (tCO_2)

EC_{CS} : Electricity consumption by the central carpools server(s) (kWh)

GE_p : Electricity generation GHG Emission factor of geographic area where the central carpool server(s) is located and is known, else geographic area of community area serviced by the carpool server. (tCO_2 /KWh)

The assessment team found assumptions, calculation procedure and algorithm used to describe the leakage emissions to be consistent with the VCS rules and requirement, as well as the appropriate integration of the uncertainness and error estimation.

3.10 Monitoring

The methodology establishes criteria for monitoring project activities carrying out carpooling activities. It has been required a monitoring plan in order to "The project proponent must establish, maintain and apply a monitoring plan and GHG information system that includes criteria and procedures for obtaining, recording, compiling and analyzing data, parameters and other information important for quantifying and reporting GHG emissions".

Along with the monitoring plan activities, each member of the carpool community shall to:

i. (Must) register with the carpool server (CS) and provide information as follows:

   1. Upload personal Identifying information (e.g, name, address, phone number, etc)
   2. Upload one or more single-occupancy trip (SOBT) details (which alternatively could be auto-learned without explicit participant input, and/or auto-verified without explicit participant input):
      a. End-points (e.g., home & work addresses or home & destination cities)
      b. Vehicle Id (e.g., vehicle VIN number)
      c. A carpool vehicle if that vehicle is only used for carpool. Example – employer provided or arranged vans for vanpool
   3. Download carpool monitoring application (CMA) on their Smartphone
   4. Place on-board diagnostic version 2 (OBDII) interface device in the carpool vehicle and if applicable on SOBT vehicle

ii. CMA running on a carpool member's Smartphone must perform the following operations:

   1. Detect and record identity of OBDII device in the vehicle. Medium Access Address (MAC address) uniquely identifies each OBDII device (other temper proof ids can also be used)
   2. Calculate and record time, distance and trip endpoints using Smartphone GPS function.
   3. When authorized, establish wireless link to OBDII device and query and records vehicle VIN number
   4. May also estimate and record fuel consumption along trip endpoints by reading fuel cycle parameters from vehicle engine control unit (ECU) through OBDII device. Depending on available fuel cycle parameters, fuel consumption is estimated using most suitable method.
   5. Detect and record identity of OBDII device in the vehicle. Medium Access Address (MAC address) uniquely identifies each OBDII device (other temper proof ids can also be used)
   6. Calculate and record time, distance and trip endpoints using Smartphone GPS function.

7. When authorized, establish wireless link to OBDII device and query and records vehicle VIN number
8. May also estimate and record fuel consumption along trip endpoints by reading fuel cycle parameters from vehicle engine control unit (ECU) through OBDII device. Depending on available fuel cycle parameters, fuel consumption is estimated using most suitable method.

iii. Upon receiving a trip report from two or more CMAs, the carpool server must establish the following:

1. Determine the carpool membership set
2. Estimate the carpool GHG emission based on carpool sub trips fuel consumption data reported by CMAs, and/or carpool sub trips distance plus vehicle VINs combined with EPA/manufacturer fuel efficiency. Vehicle VIN enables determination of vehicle EPA/manufactures estimated fossil fuel efficiency to estimate fuel consumption when OBDII based fuel consumption is not reliable or feasible. This is the fundamental block to estimate project emission.
3. Estimate the baseline emissions by assuming SOBT trips in absence of carpool trip, based on the membership set and their registered SOBTs.
4. All monitoring data for emission reduction calculations must be archived in a secure and retrievable manner for at least two years after the end of the project crediting period

Once all of the above described requirements are fulfilled, the carpool project activities proceed to monitor Baseline Emissions, Project Emissions and Leakage Emissions in order to calculate the actual Emission Reductions. The assessment team agrees with the set of rules previously in the monitoring plan of the new proposed methodology; these requirements allow monitoring of project activities using the new proposed methodology.

Similarly, the new proposed methodology determines a set of data and parameters available for validation and a different set of data and parameters to be monitored. The whole set of data and parameters is assessed and presented on table 5 as follows:

Table2: Assessment Team

Parameter	Comment / Conclusion
Data and Parameters Available at Validation	
GE_p : *Electricity generation GHG Emission factor corresponding to project geographic area* p	Figures determined at validation are available from different official sources, the methodology developer decide to use EPA as a source, nevertheless emission factors are available for different electricity generation systems related to different geographical areas. The assessment team found appropriate data unit, source of data, value applied, justification and procedures applied. Emissions related to the electricity system might be better calculated by using the specific emission factor where the carpooling project has been implemented. In order to calculate the emission factor, the CDM Tool to calculate the emission factor for an electricity system represent a very usefull tool to determne project emission on the context of the region where the

	methodology is applyed
$EF_{f(c)}$: *GHG Emission factor of fuel used by vehicle identified by VIN number c*	Since different fuels are used among different areas (project activities), fuel emission factor from official sources (such as DNAs), by the time validations are carried put is necessary. The assessment team found appropriate data unit, source of data, value applied, justification and procedures applied. The use emission factors available on the region where the methodology is applied could represent in a much better way the actual GHG emissions.
V_c: *Fossil fuel efficiency of vehicle identified by VINc*	If official sources are not available due to absence of information on the matters, project activities might use manufacturer specification when validating project activities. The methodology developer correctly included as an ex-post figure new vehicle models released after validation or new vehicle models joining the project after validation. The assessment team found appropriate data unit, source of data, value applied, justification and procedures applied.
R_c: *All electric range of vehicle identified by VIN c*	If sources are official and / or Verifiable, project activities using the new proposed methodology will be able to integrate All electric range of vehicles. The assessment team found appropriate data unit, source of data, value applied, justification and procedures applied.
W_c: *Electric efficiency of vehicle identified by VIN c*	Electric efficiency has to be verified when validating as a mean to correctly determine the baseline emissions. The methodology developer correctly considered as an ex-post addition new vehicles being part of the carpooling system. The assessment team found appropriate data unit, source of data, value applied, justification and procedures applied.
M_k : *Percentage market share of commuting transport mode* k in carpool community area	The parameter can be updated or even determined through survey designed for this purpose. The assessment team found appropriate data unit, source of data, value applied, justification and procedures applied.
Parameter	**Comment / Conclusion**
Data and Parameters Monitored.	
d_j: *Distance travelled during sub-trip j*	The assessment team found appropriated units, sources, QA/QC procedures, measurement methods, frequency of monitoring and calculation methods. Distance has to be registered in the mentioned frequency, being crosschecked with information provided by the carpool server when carrying out verification processes.
$S_{i,m}$: *Number of days a carpool member* i *drive alone during seasons* m *before joining carpool program*	The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities. In addition by raising CL 2 QA/QC procedures were defined and described in the new proposed methodology version 2.01.
$C_{i,m}$: *Number of days a carpool member* i *carpool during seasons* m *before joining carpool program*	Information provided by the new car member is registered once this person becomes a carpool member. The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities. In addition by raising CL 2

	QA/QC procedures were defined and described in the new proposed methodology version 2.01.
$C(j)$: *VIN number of vehicle used for sub-trip j*	By raising CL 2 QA/QC procedures were defined and described in the new proposed methodology version 2.01. The accurate monitoring of this parameter allows a correct quantification of the emission reductions. The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities.
N_j: *Set of members* i *carpooling together in sub-trip j. Element are meta-data (phone number or username)*	Frequency defined for this parameter in particular is logic and allows correct quantification occupancy rates. The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities.
D_i: *Single-occupancy baseline trip distance of member i*	The parameter allows the baseline quantification as well as "Shortest time distance based on source and destination addresses provide by member". This shortest distance is a conservative approach in order to not overestimate emission reductions. The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities.
$S_{y,t}$: *Set of sub-trips making up carpool trip* t *in year y*	Parameter associated to electronic monitoring of the trip and sub-trip conditions. The assessment team found appropriated, sources, procedures, measurement methods and calculation methods to be applicable and relevant for future project activities. Additionally, the determined monitoring frequency (Every carpool trip), is adequate.
i: *CMMS assigned unique identifier for a member*	The unique registration ID is essential for monitoring activities. By raising CL 2 QA/QC procedures were defined and described in the new proposed methodology version 2.01. The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities.
$S(i)$: *VIN number of register SOBT vehicle to member* i	The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities. On the matters of the frequency defined, it is necessary for each and every carpool community member to update informant periodically.
EC_{CS}: *Electricity consumption by the central carpools server(s)*	When defining monitoring frequency, project proponents will have to take into account the "frequency of external CS service provider invoices" as correctly proposes the methodology developer. By raising CL 2 QA/QC procedures were defined and described in the new proposed methodology version 2.01. The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities.
$FC_{j,c}$: *Fossil fuel consumption for sub-trip j in vehicle c*	The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities. Fuel consumption determination method will have to be defined by project proponents using this new proposed methodology.
$\hat{V}_c$: *Measured average*	By raising CL 2 QA/QC procedures were defined and described in

fossil fuel efficiency of vehicle c	the new proposed methodology version 2.01. The assessment team found appropriated, sources, procedures, measurement methods, frequency of monitoring and calculation methods to be applicable and relevant for future project activities.

4 ASSESSMENT CONCLUSION

The assessment team from ICONTEC has performed the second assessment of the new proposed methodology: "GHG Emission Reductions Through Carpooling" version number 2.01 and belonging to sectoral scope number 7, transport, issued by Greenmiles Technologies, LLC on the 24th of October 2013. This second assessment was performed based on the rules and requirements set out by the VCS framework.

Following the first assessment of the new proposed methodology, the assessment team considered that "GHG Emission Reductions Through Carpooling" version number 2.01 does not contain any non-compliance with the VCS criteria that would affect the usability of the Methodology under the VCS program. In addition, findings raised fruit of the second assessment process were correctly addressed by the methodology developer. ICONTEC received the information and asked for explanations we deemed necessary to provide enough evidence that the methodology complies with the VCS rules and requirements.

In summary it is the ICONTEC opinion that the use of the proposed methodology fully addresses the emission of GHG related to carpooling project activities. In addition, the audit team finds relevant the use of the CDM tool to calculate the emission factor for an electricity system as a mean to better calculate the Project Emissions.

5 REPORT RECONCILIATION

This section in particular is not applicable for second assessment scenarios.

6 EVIDENCE OF FULFILMENT OF VVB ELIGIBILITY REQUIREMENTS

According to the VCS Program Guide version 3, "Validation/verification bodies are eligible to provide validation and verification services under the VCS Program if they have signed the required agreement with the VCSA and are:"

1) Accredited under a VCS-approved GHG program;
2) Accredited under ISO 14065 for scope VCS by an accreditation body that is a member of the International Accreditation Forum; or
3) Approved under the VCS temporary accreditation program.

In this sense, ICONTEC is an international organization accredited by United Nations for "validation and verification functions for the following sectoral scopes:

1. Energy Industries (renewable / non-renewable sources
2. Energy distribution
3. Energy demand
4. Manufacturing industries
5. Chemical industries
7. Transport
10. Mining / Mineral Production
13. Waste handling and disposal
14. Afforestation and reforestation
15. Agriculture

6.1.1 Waste handling and disposal

6.1.2 Afforestation and reforestation,

6.1.3 Agriculture"

Since the accreditation was granted by the CDM executive board and the CDM is a VCS-approved GHG program, ICONTEC fulfils the eligibility criteria.

7 SIGNATURE

Signed for and on behalf of:

Name of entity:	ICONTEC (Instituto Colombiano de Normas Técnicas y Certificación)
Signature:	
Name of signatory:	Monica Vivas, _ Director of Conformity Assessment Services
Date:	13th of February 2014

APPENDIX 1

Table A-1: Assessment Findings

Finding	Reference	Summary of project owner response	Validation conclusion
CL1 According to the proposed methodology, procedure to determine the baseline scenario establishes a two year period for every carpooling member to update information related to: • Single-occupancy baseline trip (SOBT) • Working Address, and • Home address No criterion has been defined in order to justify a two year period as the frequency for collection such importance information for project activities applying the new proposed methodology.	Validation and Verification Manual version 3.1: 3.2.5 Monitoring Plan	*As stated in the methodology, SOBT vehicle, Home address and Work address is kept up to date by the member when such change occurs. However, it is possible that some member may forget to update such information resulting in stale information in project proponent database.* *The project proponent initiated step to get a positive confirmation from the member every two years of SOBT vehicle, work and home address ensure that such stale information is made current.* *The frequency of positive confirmation needs to balance with the cost for such step on project proponent and the carpool member.* *In many states within USA 2 years frequency is used for registration and emission sticker renewal, 5 years for license renew (that also get make home address current if not updated by the driver) and 10 years for picture update. Hence 2 year frequency is reasoned appropriate.*	**Assessment team Conclusion:** The assessment team found explanations provided by the methodology developer to be sufficient. In addition, balance with costs of project activities allows the two years period. **Finding Status**: CLOSED on 21/05/2014

CL2 On section 9 of the proposed new methodology (9.1 data and parameters), no QA/QC procedures have been determined for parameters: • $S_{i,m}$ • $C_{i,m}$ • $C(j)$ • i • EC_{CS} • $\hat{V}_c$ Neither justification for the absence of QA/QC procedures has been described.	Validation and Verification Manual version 3.1: 3.2.5 Monitoring Plan	*Parameters updated in the version 2.01 of the document.*	**Assessment team Conclusion:** QA/QC procedures included on the methodology version 2.01 allow a complete and accurate monitoring of future project activities **Finding Status:** CLOSED on 21/05/2014
CL3 Taken into account that measurements will be taken by electronic devices (such as smartphones using and/or and GPSs), how precision and accuracy of the measurement equipments has been taken into account when determining figures of the different parameters? On the other hand, how the methodology events such as signal failures have been taken into account when developing the new proposed methodology?	Validation and Verification Manual version 3.1: 2.1.2 Verification objectives	*GPS accuracy is generally within 10 meters or better (http://www.gps.gov/systems/gps/performance/accuracy/) which is insignificant compared to trip travel distance.* *Technically there is no GPS signal failure. Rather phone/GPS device are unable to receive GPS satellite signal due to high buildings (i.e. in downtown New York or San Francisco) or underground tunnels. In such case distance measured would be lesser than actual distance travelled which is conservative*	**Assessment team Conclusion:** The assessment team agrees with the assumption of accuracy for electronic devices, taking into account that this approach is conservative. **Finding Status:** CLOSED on 21/05/2014

CL4 Parameter $EF_{f\,(c)}$ relies on EPA studies as source of information, nevertheless the new proposed methodology does not describe, neither state, how changes on fuel composition and issues concerning to vehicle obsolescence has been taken into account, this is to say, how emission factor is affected by vehicles obsolescence. Other methodologies apply additional considerations such as the technologic improvement factor as part of the means to determine in a more accurate way the Emission Factor.	Validation and Verification Manual version 3.1: 3.2.5 Monitoring Plan	*Fuel composition change and $EF_{f\,(c)}$:* *Morden vehicles are highly optimized for expect fuel composition and any change is fuel composition would offset this tuning. Hence if economy wide fuel composition change is instituted, following assertions about new fuel composition can be reasonably made:* 1. *New fuel composition doesn't negatively impact average vehicle performance* 2. *Average GHG emissions from new fuel composition is less or at least roughly the same as old fuel composition* *Hence updating emission factor for given fuel type at crediting period is justified.* *Vehicle obsolescence: Comparatively both SOBT vehicles and carpool vehicle undergo obsolescence resulting in decreasing vehicle efficiency and increasing baseline and project GHG emission for 1 km travel distance.* *It should be noted that for a given carpool trip, sum of SOBT distance ($\sum_{i\in N_{y,t}} D_i$) is always greater than carpool sub-trip distance ($\sum_{\{j\in S_{y,t}\}} d_j$).* *Hence, assuming same SOBT and carpool vehicle efficiencies, increase in based-line emission due to vehicle obsolescence is higher than*	**Assessment team Conclusion:** The assessment team agrees with the approach proposed by the methodology developer, in terms of the Emission factor updating **Finding Status:** CLOSED on 21/05/2014

		that of project emission resulting in larger GHG reduction. By using non-obsolescence vehicle efficiencies GHG reduction is less and hence conservative.	
CL5 Methodology developer is requested to clarify how 30-day public consultation period comments have been taken into account for the methodology development process.	Validation and Verification Manual version 3.1: 5.1.1 Key Elements of the Process.	*Only one comment was received during the public consultation period. As reasoned in first assessment, the comment doesn't require any modification to the methodology. However, completeness and clarification, equation 3 and 4 respectively are added.*	**Assessment team Conclusion:** Information provided on Methodology version 2.01 integrates comment fruit of the 30-day public consultation period **Finding Status:** CLOSED on 21/05/2014
CL6 Typographical mistakes have been found throughout documentation related to the new proposed methodology	Validation and Verification Manual version 3.1: 5.1.1 Key Elements of the Process.	*Please identify this typos so that they can be corrected.*	**Assessment team Conclusion:** Methodology Developer correctly addressed typographical mistakes along the text of the new proposed methodology. Changes are visible on the latest version of the methodology: version 2.01 **Finding Status:** CLOSED on 21/05/2014