FIRST ASSESSMENT REPORT FOR THE "METHODOLOGY FOR ELECTRIC VEHICLE CHARGING SYSTEMS"

Document Prepared by SCS Global Services

Methodology Title	Methodology for Electric Vehicle Charging Systems / Activity Method for Determining Additionality of Electric Vehicle Charging Systems	
Version	1.1	
Methodology Category	Methodology	X
	Methodology Revision	
	Module	X
	Tool	
Sectoral Scope(s)	Sectoral Scopes 1 and 7 (Energy, Transport)	

Report Title	First assessment report for the "Methodology for Electric Vehicle Charging Systems" and "Activity Method for Determining Additionality of Electric Vehicle Charging Systems"
Report Version	1.0
Client	Climate Neutral Business Network, a project of Strategic Environmental Associates Inc, on behalf of the EV Charging Carbon Coalition
Pages	72
Date of Issue	1 August 2018

Prepared By	SCS Global Services (SCS)
Contact	2000 Powell Street, Suite 600, Emeryville, CA 94608, USA http://www.scsglobalservices.com Email: cpollet-young@scsglobalservices.com Telephone: +1 (510) 452-8000
Approved By	Christie Pollet-Young, Director, GHG Verification
Work Carried Out By	Lead Assessors: Barbara Toole O'Neil, Michael Lehmann Assessor: Tiffany Mayville Technical Reviewer: Scott Eaton

Summary:

This report describes the first assessment of the "Methodology for Electric Vehicle Charging Systems" (the "methodology") and the associated "Activity Method for Determining Additionality of Electric Vehicle Charging Systems" (the "activity method"). The methodology applies to the charging of electric vehicles (EVs) through EV charging systems and infrastructures and the activity method allows for determination of the additionality of projects applying the methodology. The purpose of the assessment is to assess the conformance of the methodology to the VCS rules and current best practices for quantification of GHG emission reductions and removals. The assessment was performed through a desk review of the methodology and other relevant documents. The criteria for the assessment was the VCS Version 3. The conclusion of the assessment report is that the methodology adheres to the methodology assessment criteria, as stated in Section 4, below. No uncertainties are associated with the assessment. Sixteen non-conformity reports, four requests for new information and three observations were issued during the course of the assessment. All findings were addressed by the methodology developer by providing further clarifications and by revising, as necessary, the methodology and the activity method.

Table of Contents

1 INTRODUCTION

1.1 Objective

The purpose of the audit activity was to conduct the first assessment of the methodology "Methodology for Electric Vehicle Charging Systems" and "Activity Method for Determining Additionality of Electric Vehicle Charging Systems" in accordance with the guidance documents listed in Section 2.1 of this report.

1.2 Summary Description of the Methodology

The methodology which was developed for the charging of electric vehicles (EVs) through EV charging systems, including their associated infrastructure, whose GHG emission reductions are achieved through the displacement of emissions from conventional fossil fuel vehicles used for passenger and freight transportation from the electricity delivered by the project chargers.

2 ASSESSMENT APPROACH

2.1 Method and Criteria

In accordance with the Methodology Approval Process, the scope of the assessment included the following:

- Applicability conditions: Assessment of whether the proposed methodology's applicability conditions are appropriate, adequate and in compliance with the VCS rules.
- Project boundary: Assessment of whether an appropriate and adequate approach is provided for the definition of the project's physical boundary and sources and types of GHGs included.
- Procedure for determining the baseline scenario: Assessment of whether the approach for determining the baseline scenario is appropriate, adequate and in compliance with the VCS rules.
- Procedure for demonstrating additionality: Assessment of whether the approach/tools for determining whether a project is additional are appropriate, adequate and in compliance with the VCS rules.
- Baseline emissions: Assessment of whether the approach for calculating baseline emissions is appropriate, adequate and in compliance with the VCS rules.
- Project emissions: Assessment of whether the approach for calculating project emissions is appropriate, adequate and in compliance with the VCS rules.
- Leakage: Assessment of whether the approach for calculating leakage is appropriate, adequate and in compliance with the VCS rules.
- Quantification of net GHG emission reductions and/or removals: Assessment of whether the approach for calculating the net GHG benefit of the project is appropriate, adequate and in compliance with the VCS rules.
- Monitoring: Assessment of whether the monitoring approach is appropriate, adequate and in compliance with the VCS rules.
- Data and parameters: Assessment of whether the specification for monitored and not monitored data and parameters is appropriate, adequate and in compliance with the VCS rules.
- Adherence to the project principles of the VCS Program: Assessment of whether the methodology adheres to the VCS Program principles set out in the VCS Standard.
- Relationship to approved or pending methodologies: Assessment of whether any existing methodology could reasonably be revised to serve the same purpose as the proposed methodology.

The proposed methodology and activity method were assessed for conformance against the VCS Version 3, including the following documents:

- VCS Standard, Version 3.7
- VCS Methodology Approval Process, Version 3.7, 21 June 2017
- VCS Standard, Version 3.7, 21 June 2017
- VCS Program Guide, Version 3.7, 21 June 2017
- VCS Program Definitions, Version 3.7, 21 June 2017
- VCS Guidance for Standardized Methods, Version 3.3, 8 October 2013
- VCS Validation and Verification Manual, Version 3.2, 19 October 2016
- VCS Methodology Report Template, Version 3.1, 8 October 2013

The primary method used for this assessment was a document review, as described in Section 2.2 of this report. This is the first assessment using the new Verra streamlined methodology approval process.

2.2 Document Review

The assessment activity included a detailed review of the methodology against the criteria of the guidance documents listed in Section 2.1 of this report. 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.

Review of the methodology was complemented by a review of the provided resources and published literature relevant to the development of the methodology. The following articles or reports were reviewed to ensure the conformance of the proposed revision with the guidance documents listed in Section 2.1 of this report:

- 2016-APTA-Vehicle-Database EB sorted Nov 10 incl now by state each EB % SCS.xls
- AC-SH-05 PHEV BEV LTD Volumes CBSA - Jan 1 2017sh SH May 11 PRINT.xls
- AC-SH-06 PHEV BEV Medium Heavy Duty SH March 30 May 12 Summary.xls
- Australia MS analysis.xls
- Edrive_Sales_July16(1) SH analysis Aug 16 22 25 Sept 5 Sept 14 Oct 26 April13 SUMMARY SCS CORE DATA.xls
- MODULE Appendix C CBSA MS US.docx
- MODULE LDV and HDV Default Calculation Values US and Canada.docx
- MODULE US State MS.doc
- Canada PHEV July 27 replicate final.cvs
- MY2012-2018 Battery Electric Vehicles EVCCC ANALYSIS.docx
- MY2016 Fuel Consumption Ratings comp FF vehs consumption figures.docx

The referenced reports were reviewed, and the assessment was completed.

2.3 Interviews

Additional information regarding the basis for the criteria and procedures contained within the methodology was provided by Ms. Sue Hall, Climate Neutral Business Network during conference calls on 31 May; 21 and 26 June; 10 and 17 July 2018; and via email.

2.4 Assessment Team

Barbara Toole O'Neil led the assessment and performed or directly supervised all aspects of the work, including assessment, interviews and report writing. Ms. Toole O'Neil has been the lead assessor or part of the assessment team for the following VCS methodologies:

- VM0025: Campus Clean Energy and Energy Efficiency, Version 1.0; VMD0038: Campus Clean Energy and Energy Efficiency: Campus-Wide Module, Version 1.0 and VMD0039, LEED-Certified Buildings Module (12 February 2014).
- VMR 001, Revisions to ACM0008 to Include Methane Capture and Destruction from Abandoned Coal Mines
- VMR002, Revisions to ACM0008 to Include Pre-drainage of Methane from an Active Open Cast Mine as a Methane Emission Reduction Activity
- VM0014, Interception and Destruction of Fugitive Methane from Coal Bed Methane (CBM) Seeps
- VM001, Infrared Automatic Refrigerant Leak Detection Efficiency Project Methodology

Ms. Toole O'Neil is also a VCS approved standardized methodology expert. In the past year, she participated as the standardized methodology expert for the "VM0007 REDD+ Methodology Framework (REDD-MF), v1.5" module.

Michael Lehmann was the co-lead assessor supporting the assessment. He currently works as Approval Engineer in DNV GL Maritime and performs type approval of ballast water management systems (BWMS). In the period from 1999 to 2015 he worked in DNV Climate Change Services with validation and verification of climate change mitigation projects and managed or participated in the validation and verification of many CDM, VCS and JI projects and assessment of methodologies. He also chaired the VCS Steering Committee on Standardized Methods for Baselines and Additionality which developed VCS requirements for standardized methods over the course of 2011. He is a VCS approved standardized methods expert.

Tiffany Mayville assisted the Lead Assessor with various aspects of the assessment, including coordinating the team and activities and reviewing the report. Ms. Mayville is competent in numerous GHG offset and footprint standards and methodologies. She is responsible for managing the GHG Program's quality systems to ensure compliance with the applicable ANSI accreditation. Ms. Mayville holds a Bachelor of Arts in Environmental Studies from the University of California, Santa Barbara.

Scott Eaton holds a Master's in Environmental Science and Management from the Bren School at UCSB, and a Bachelor's in Environment, Economics, and Politics from Claremont McKenna College. During his time at the Bren School, Mr. Eaton focused his studies on climate change mitigation, with coursework in carbon accounting, energy and resource productivity, statistical analysis and environmental modeling. His Master's thesis calculating the carbon footprint of food served by Kaiser Permanente demonstrated skills in data management and corporate sustainability planning. Mr. Eaton is well versed in a variety of approaches to carbon accounting, having reviewed many methodologies under various greenhouse gas offset and footprint standards. He has been trained as a lead auditor in addition to his role managing SCS' quality management system and day-to-day operations. Mr. Eaton has been at leader at SCS in conducting Energy Efficiency verifications under the Verified Carbon Standard. Prior to coming to SCS, Scott worked with Engineers Without Borders, Agros International, and the Seattle Biochar Working Group to develop biomass energy projects in developing countries. Mr. Eaton is proficient in Spanish and Portuguese, as exemplified through extensive fieldwork in Central America, research on land use in the Brazilian Amazon, and regular correspondence with clients throughout Latin America.

2.5 Resolution of Findings

Potential material discrepancies identified during the assessment process were resolved through the issuance of findings. The types of findings issued by SCS were characterized as follows:

Non-Conformity Reports (NCRs) were issued in response to material discrepancies in the proposed revision. A material discrepancy could be defined as:

- An instance of nonconformance to the guidance documents listed in Section 2.1 of this report;
- An instance where the language of the methodology element required clarification in order to avoid ambiguity;
- An instance where the proposed methodology lacked internal consistency; or
- An instance where formulae in the proposed revision were not consistent with mathematical convention.

An adequate response for each issued NCR, including evidence of corrective action, was required before a positive assessment opinion could be reached.

New Information Requests (NIRs) were issued to the client when more information was needed to determine whether a material discrepancy existed. Issuance of an NIR did not necessarily signify the presence of a material discrepancy. However, an adequate response to all issued NIRs was required before an assessment opinion could be reached.

Observations (OBSs) were issued to the client when an opportunity for improvement in the proposed revision was identified. Such opportunities for improvement did not constitute material discrepancies. OBSs were considered resolved on issuance, and therefore a response to issued OBSs was not required before an assessment opinion could be reached.

In total, 16 non-conformity reports, four requests for new information and three observations were issued during the assessment. All issued findings are described in Appendix A below.

The main findings identified during the assessment process were related to the application and clarity of the methodology. The supporting references and analysis were reviewed with no identified findings.

All findings were addressed by the methodology developer by providing further clarifications. The methodology and activity method were, as necessary, modified in response to issues raised during the assessment process for clarity and to conform to the VCS rules.

All findings and the responses provided by the methodology developer are included in Appendix A to this assessment report.

3 ASSESSMENT FINDINGS

3.1 Relationship to Approved or Pending Methodologies

No existing pending or approved methodology that was available 60 days before the methodology was submitted to Verra for public consultation, in accordance with Section 5.2.1(1) of the Methodology Approval Process could reasonably be revised to serve the same purpose as the methodology. Approved and pending VCS, Climate Action Reserve (CAR), and Clean Development Mechanism (CDM) methodologies for all sectoral scopes were reviewed for the appropriate sectoral scopes. One CDM methodology *AMS-III.C. Emission Reductions by Electric and Hybrid* Vehicles was identified as possibly

applicable. After consultation with Verra, the methodology developers determined that proposing a new methodology resulted in more straightforward and user-friendly methodology than revising the CDM methodology for the same purpose.

This methodology applies to the charging of electric vehicles (EVs) through EV charging systems and provides easy-to-use monitoring parameters to quantify emission reductions. This methodology is applicable globally and provides a positive list for determining additionality for regions with less than five percent market penetration of electric vehicles. The positive list is found in Activity Method for Determining Additionality of Electric Vehicle Charging Systems, v1.1.

3.2 Stakeholder Comments

This methodology was open for public comment from 20 May 2018 until 20 June 2018. No comments were received during the public comment period.

3.3 Structure and Clarity of Methodology

The methodology and activity method are written in a clear, logical, concise and precise manner. Procedures and criteria are logically presented and easily understood. The methodology and activity method are internally consistent. Equations are mathematically sound, and parameters are presented consistently throughout the text of the methodology element. Furthermore, this report affirms that:

- **The developer has followed the instructions in the methodology template and ensured that the methodology's various criteria and procedures are documented in the appropriate sections of the template**. The methodology was written clearly and logically in a style that ensure consistent application by intended users.

- **The terminology used in the methodology is consistent with that used in the VCS Program, and GHG accounting generally**. All definitions are consistent with those in the VCS program definitions, ISO 14064-2:2006, or other VCS guidance documents (e.g., standardized methodologies).

- **The key words must, should and may have been used appropriately and consistently to denote firm requirements, (non-mandatory) recommendations and permissible or allowable options, respectively.** This convention is intentionally followed throughout the methodology element.

- **The criteria and procedures are written in a manner that can be understood and applied readily and consistently by project proponents**. The criteria and procedures are clearly presented and should be readily accessible to users with the necessary competencies.

- **The criteria and procedures are written in a manner that allows projects to be unambiguously audited against them.** The criteria and procedures are in some cases not highly prescriptive; however, they are sufficiently prescriptive as to allow unambiguous assessment of projects, particularly in combination with other VCS requirements.

In conclusion, the methodology and the activity method are structurally sound and of adequate clarity.

3.4 Definitions

The assessment team concludes, overall, that the definitions for terms used by the methodology and the activity method are appropriate and in conformance with the VCS rules. The definitions are clearly and

appropriately set out in Section 3 of the methodology and are consistently used within the methodology and activity method.

3.5 Applicability Conditions

The assessment team concludes, overall, that the applicability conditions are appropriate and in conformance with the VCS rules.

3.5.1 Assessment of Conditions as a Whole

An assessment of the applicability conditions, as a whole, follows.

Criterion	Assessment findings
Are the applicability conditions appropriately specified?	**Yes**; as described for each condition in Section 3.5.2 below, all conditions are specified with appropriate clarity and precision
Are the applicability conditions appropriate for the project activities targeted by the methodology and the quantification procedures set out within the methodology?	**Yes**; the conditions ensure the following: That the EV charging systems account for all possible sources to charge the EV batteries within the boundary of the project.
Are the applicability conditions as a whole sufficiently clear for determining which project activities are eligible under the methodology, and which are not?	**Yes**; the conditions make use of clear and commonly-used terminology to clarify which project activities are eligible
How do the applicability conditions address environmental integrity and practical considerations?	**Yes**; the conditions limit applicability to EV charging systems whose GHG emission reductions are achieved through the displacement of conventional fossil fuel vehicles used for passenger and freight transportation.

3.5.2 Assessment of Each Applicability Condition

An identification and discussion of each conditions follows.

		Explanation of whether…	
Condition	**Overall applicability condition**	**The applicability condition is written in a sufficiently clear and precise manner**	**Conformance with the applicability condition can be demonstrated at the time of project validation**
1.	The applicable fleets of projects applying this methodology are limited to all LDV BEVs and PHEVs, and HDV EVs. For LDV projects, these applicable fleets comprise BEVs and PHEVs for L1 and L2 chargers, and BEVs for DCFCs. For	Condition is written with adequate clarity and detail.	The requirement can be assessed at time of validation.

		Explanation of whether…	
Condition	**Overall applicability condition**	**The applicability condition is written in a sufficiently clear and precise manner**	**Conformance with the applicability condition can be demonstrated at the time of project validation**
	HDV projects, these applicable fleets comprise the MDV/HDV electric buses and trucks, both BEV and PHEV, eligible to charge at the project's set of EV charging systems.		
2.	Project proponents must demonstrate that the EV models comprising the applicable fleet of the project are comparable to their conventional fossil fuel baseline vehicles using the following means: • Project and baseline vehicles belong to the same vehicle category (e.g., car, motorcycle, bus, truck, LDV, MDV, HDV); • Project and baseline vehicles have comparable passenger/load capacity (comparing the baseline vehicle with the respective project vehicle). • Where project proponents apply the baseline emission default factors for MPG and AFEC determined	Condition is written with adequate clarity and precision, as the terms are defined in the methodology and readily understood by EV and other vehicle owners	The conditions relate to specific project activities and conformance can be demonstrated at time of validation.

		Explanation of whether…	
Condition	**Overall applicability condition**	**The applicability condition is written in a sufficiently clear and precise manner**	**Conformance with the applicability condition can be demonstrated at the time of project validation**
	for the US and Canada, this comparability requirement between applicable and comparable fleet models has already been completed and satisfied.		
3.	In order to demonstrate that double counting of emission reduction will not occur, the project proponent must maintain an inventory of EV chargers included in the project, including their L1/L2/DCFC classifications and unique identifiers; other measures may include disclosure of credit ownership to EV drivers. Double counting relative to any issued EV fleet credits will be addressed using the emission reduction discount adjustments in section 8.4 below. Where associated infrastructure and/or renewable power (on-site and/or direct transmission) are included in an EV charging system, this must be referenced and described in the charging	Condition is written with adequate clarity and precision.	The condition relates maintenance of appropriate documentation developed during the project start-up and is defined in the project. Conformance can be demonstrated at time of validation

		Explanation of whether…	
Condition	**Overall applicability condition**	**The applicability condition is written in a sufficiently clear and precise manner**	**Conformance with the applicability condition can be demonstrated at the time of project validation**
	system's inventory. Project documentation must also include the following for each EV charger: • Classification using the performance voltage, AC/DC basis and kw power specifications given for L1, L2 and DCFC 50/100/150/320/500 definitions • Unique identifiers, including the geo-spatial coordinates and one other unique reference such as NEMA codes, customer codes, equipment serial numbers, charger ID codes, or AFDC ID codes		
4.	The methodology is applicable to EV charging systems utilizing AI to provide electricity to EVs to store and dispatch electricity to and from multiple sources, both on site and regionally, under the condition that the AI must include adequate metering systems (e.g., meters/sub-meters and/or associated measurement systems). These metering	Condition is written with adequate clarity and describes how AI system information should be used.	The condition relates to the use of AI in charging EVs and can be assessed at validation.

		Explanation of whether…	
Condition	**Overall applicability condition**	**The applicability condition is written in a sufficiently clear and precise manner**	**Conformance with the applicability condition can be demonstrated at the time of project validation**
	systems must measure and accurately trace all electricity deliveries and receipts from all such interrelated associated infrastructure sources. This includes electricity sourced from/returned to the grid, dedicated renewable energy (RE) generated on-site (including RE sourced from direct transmission lines), on-site storage batteries, and/or the EV's on-board battery		
5.	Projects with estimated annual emission reductions of over 60,000 tCO2e (large-scale) are permitted where project proponents can demonstrate that the project is located in a country with credible national data sources for GHG emission calculations. Otherwise, projects are limited to annual emission reductions equal to or under 60,000 tCO2e (small-scale). Projects located in Annex I and II countries, and countries referenced by EIA data sources, are automatically eligible to be of any scale. All regions listed in Activity Method for Determining Additionality of Electric Vehicle Charging	Condition is written with adequate clarity and precision.	This condition defines the size of the project and follows similar CDM approaches. The condition also specifies applicability of the development status of a country, e.g. Annex I

		Explanation of whether…	
Condition	**Overall applicability condition**	**The applicability condition is written in a sufficiently clear and precise manner**	**Conformance with the applicability condition can be demonstrated at the time of project validation**
	Systems, v1.0 meet these criteria and thus are not limited in scale		
6.	Project proponents must demonstrate proof of ownership of emission reductions which may be achieved with the charging system owners through contractual agreements, terms of service, utility program participation rules, or other means and with EV drivers through disclosure of credit ownership (e.g. through dispenser notices, screen displays, terms of service, etc.).	Condition is written with adequate clarity and precision.	This condition specifies instruments of ownership and can be demonstrated at validation.

3.6 Project Boundary

The approach for identifying the project boundary is appropriate for the project activities covered by the methodology. The assessment team concludes, overall, that the specification of the project boundary is of adequate clarity and in conformance with the VCS Standard. Further identification and discussion of the project boundary is provided below.

3.6.1 Spatial Boundary

Project boundary element(s)	Assessment findings
The boundary encompasses applicable fleets using project EV chargers as specified in the methodology.	• Clearly specified and consistent with VCS Standard § 4.4. in identifying the applicable boundary.

Project boundary element(s)	Assessment findings
The spatial extent of the project boundary encompasses the geographic boundary where the EV charging systems are located	• Clearly specified and consistent with VCS Standard § 4.4. The spatial extent of the project boundary encompasses the geographic boundary. A project can be developed anywhere EV charging systems can be located globally.
The EV charging systems of the project activity including their electricity supply sources and associated infrastructure.	• Clearly specified and consistent with VCS Standard § 4.4. The criteria and procedures for describing the project boundary and identifying and assessing GHG sources relevant to the project and baseline scenarios are identified. Justification for GHG sources included or excluded was provided. There are no sinks or reservoirs.

3.6.2 Greenhouse gases

The procedures for determination of the GHG sources included in the project boundary conform to the VCS rules, as specifically discussed for each GHG source below.

Source		Gas	Selected	Assessment Comments
Baseline	Fossil fuel combustion of vehicles displaced by project activities	CO_2	Yes	CO_2 is appropriately included; methane and nitrous oxide are much less and optional
		CH_4	Optional	Emissions are much lower, and inclusion/exclusion is optional
		N_2O	Optional	Emissions are much lower, and inclusion/exclusion is optional
		Other	No	Not Applicable
Project	Electricity consumption via grid	CO_2	Yes	CO_2 is appropriately included since there is a probability that some of the electricity will come from fossil-based generation
		CH_4	Optional	Emissions are much lower, and inclusion/exclusion is optional but shall be included in case CH_4 emissions are included in the baseline.
		N_2O	Optional	Emissions are much lower, and inclusion/exclusion is optional but shall be included in case N_2O emissions are included in the baseline.
		Other	No	Not Applicable.
	Renewables via on-	CO_2	Yes	CO_2 is appropriately included since some renewable energy generates CO_2

Source		Gas	Selected	Assessment Comments
	site/direct transmission	CH_4	Optional	Emissions are much lower, and inclusion/exclusion is optional but shall be the included in case CH_4 emissions are included in the baseline.
		N_2O	Optional	Emissions are much lower, and inclusion/exclusion is optional but shall be included in case N_2O emissions are included in the baseline.
		Other	No	Not Applicable
	On-site battery storage	CO_2	Yes	CO_2 is appropriately included
		CH_4	Optional	Emissions are negligible, and inclusion/exclusion is optional but shall be included in case CH_4 emissions are included in the baseline.
		N_2O	Optional	Emissions are negligible, and inclusion/exclusion is optional but shall be included in case N_2O emissions are included in the baseline.
		Other	No	Not Applicable
	EV battery storage in vehicle	CO_2	Yes	CO_2 is appropriately included.
		CH_4	Optional	Emissions are negligible, and inclusion/exclusion is optional but shall be included in case CH_4 emissions are included in the baseline.
		N_2O	Optional	Emissions are negligible, and inclusion/exclusion is optional but shall be included in case N_2O emissions are included in the baseline.
		Other	No	Not Applicable

3.7 Baseline Scenario

A project method is used for identifying alternative baseline scenarios and determining the most plausible scenario. The criteria and procedures for determining the baseline scenario are appropriate for the project activities covered by the methodology. The assessment team concludes, overall, that the criteria and procedures for determining the baseline scenario are in conformance with the VCS Standard §4.5.1.

Through use of the baseline evaluation, the methodology complies with the relevant requirements

VCS Standard reference	**Assessment findings**
Section 4.5.1(1)	• The project methodology approach uses a detailed list to identify the applicable GHG sources. There are no sinks and reservoirs.

VCS Standard reference	Assessment findings
Section 4.5.1(2)	• The methodology establishes the existing and alternative project scenarios and what project accounting to complete for the baseline evaluation. The information provided meets the requirements of this section.
Section 4.5.1(3)	• Detailed sources are provided to identify the sources and reliability of data in the methodology and activity method. The information provided meets the requirements of this section.
Section 4.5.1(4)	• Substantial supporting information discussing future technological developments and assumptions was provided, meeting the requirements of this section.

3.8 Additionality

This methodology uses the *Activity Method for Determining Additionality of Electric Vehicle Charging Systems* to determine additionality. Step 1, Regulatory Surplus, requires the project proponent demonstrate regulatory surplus in accordance with the rules and requirements regarding regulatory surplus set out in the latest version of the VCS Standard, §4.1.10 and 4.6.3. Step 2, Positive List, has established a positive list of countries where the activity penetration of EVs has been demonstrated to be less than five percent, as differentiated by LDVs and HDVs. The positive list was established using the activity penetration option in §4.5.9 1) Option A to develop the positive list. The analysis was provided to the assessment team and found to meet the requirements of §4.1, 4.5 and 4.6.

Alternatively, in case the activity method is not applicable, a project method may be applied to demonstrate additionality by applying the CDM methodological tool *Demonstration of additionality of small-scale project activities* (small-scale projects) or the CDM *Tool for the demonstration and assessment of additionality* (large-scale projects).

The assessment team concludes, overall, that the criteria and procedures for determining additionality are in conformance with the VCS Standard.

3.9 Quantification of GHG Emission Reductions and Removals

3.9.1 Baseline Emissions

The assessment team concludes, overall, that the procedures for calculating baseline emissions are in conformance with the VCS rules.

An assessment of the criteria and procedures for calculating baseline emissions, as a whole, follows.

Criterion	Assessment findings
Are procedures for calculating baseline emissions and removals are appropriate for the project activities covered by the methodology?	**Yes**; procedures comply with all VCS rules for the category of project activities covered by the methodology. Baseline emissions are calculated by converting the electricity used to charge project

Criterion	Assessment findings
	applicable fleet vehicles at the EV chargers into distance travelled and multiplying this by the emission factor for fossil fuels used by baseline comparable fleet vehicles to travel the same distance.
Are all algorithms, equations and formulas used appropriate and without error?	**Yes**; the assessment team carefully reviewed procedures and confirmed that all equations are appropriate and without mathematical errors; equations are consistent with best practices for GHG accounting.
Do procedures for calculating baseline emissions and removals cover all GHG sources, sinks and reservoirs (and carbon pools) included in the project boundary?	**Yes**; procedures include all sources included in project boundary, which is the geographic boundary of the EV charging stations.
Are all models or default factors used are appropriate and in conformance with VCS requirements on same?	**Yes,** default factors referenced are all from long standing public sources that have been available for many years. They are in conformance with VCS requirements.

3.9.2 Project Emissions

Project emissions include the electricity consumption associated with the operation of the applicable fleet. Where projects include associated infrastructure within their charging systems, project emissions must include the associated infrastructure consumption. The project emissions are calculated following the equations in §8.2 of the methodology. The assessment team concludes, overall, that the procedures for calculating project emissions are in conformance with the VCS Standard.

Criterion	Assessment findings
Are procedures for calculating project emissions and removals appropriate for the project activities covered by the methodology?	**Yes**; procedures comply with all VCS Standard rules for the category of project activities covered by the methodology, as described in Section 3.9.1 above.
Are all algorithms, equations and formulas used appropriate and without error?	**Yes**; the assessment team carefully reviewed procedures and confirmed that all equations are appropriate and without mathematical errors; equations are consistent with best practices for GHG accounting.
Do procedures for calculating baseline emissions and removals cover all GHG sources, sinks and reservoirs included in the project boundary?	**Yes**; procedures include all sources included in project boundary. Project emissions include the electricity consumption associated with the operation of the applicable fleet and any associated infrastructure included in the project boundary.

Criterion	Assessment findings
Are all models or default factors used are appropriate and in conformance with VCS requirements on same?	**Yes,** default factors referenced are all from long standing public sources that have been available for many years. They are in conformance with VCS requirements.
Are procedures for estimating parameters related to the quantification of project emissions appropriate	**Yes**; see Section 3.10 below for more details

3.9.3 Leakage

SCS concurs with the explanation provided by the methodology developer that there is no leakage in the proposed methodology. An explanation of the possible leakage evaluation was provided. The result of the evaluation determined any leakage would be de minimis.

3.9.4 Net GHG Emission Reductions and Removals

The assessment team concludes, overall, that the procedures for calculating net GHG emission reductions and removals are in conformance with the VCS Standards.

An assessment of the criteria and procedures for calculating net GHG emission reductions and removals, as a whole, follows.

Criterion	Assessment findings
Are procedures for calculating net GHG emission reductions and removals appropriate for the project activities covered by the methodology?	**Yes**; procedures comply with all VCS Standard rules for the category of project activities covered by the methodology. Baseline missions are calculated by converting the electricity used to charge project applicable fleet vehicles at the EV chargers into distance travelled and multiplying this by the emission factor for fossil fuels used by baseline comparable fleet vehicles to travel the same distance. Project emissions include the electricity consumption associated with the operation of the applicable fleet and any associated infrastructure included in the project boundary.
Are all algorithms, equations and formulas used appropriate and without error?	**Yes**; the assessment team carefully reviewed procedures and confirmed that all equations are appropriate and without mathematical errors; equations are consistent with best practices for GHG accounting.
Are uncertainties associated with the quantification of net GHG emission reductions addressed appropriately?	**Yes**; uncertainties are addressed through extensive explicit accounting, guidance and procedures for selection of conservative values.

Further identification and discussion of the procedures for calculating net GHG emission reductions and removals is provided below.

Procedure	Sec.	Assessment findings
Calculation of net GHG emissions reductions	8.4	• Equations 10-11 are used for the calculation of net GHG emissions reductions. The net emissions reduction is the difference between the baseline emissions and the project emissions. Baseline missions are calculated by converting the electricity used to charge project applicable fleet vehicles at the EV chargers into distance travelled and multiplying this by the emission factor for fossil fuels used by baseline comparable fleet vehicles to travel the same distance. Project emissions include the electricity consumption associated with the operation of the applicable fleet and any associated infrastructure included in the project boundary.
Estimation of uncertainty	8.4	• The uncertainty is addressed throughout the methodology using defined criteria for data and emissions factors. It is consistent with §4.1.4 of the VCS Standard
Calculation of verified carbon units	8.4	• Calculation of verified carbon units is accomplished using equations 10-11, the same equation used for the calculation of net GHG emissions reductions.

3.10 Monitoring

The assessment team concludes, overall, that the procedures for monitoring are in conformance with the VCS Standard, §4.8.1-4.8.4. including data and parameters to be reported, sources of data and units of measurement and are discussed below. The procedures for monitoring are appropriate for the project activities covered by the methodology, as further described for each data/parameter below.

Further identification and discussion of the procedures for monitoring is provided below.

Procedure	Sec.	Assessment findings
Requirements for monitoring plan	9.2	• Sets out purpose of monitoring, as required by § 4.8.4(1) of VCS Standard • Introduces requirements for monitoring plan (not required by assessment criteria but helpful to ensure consistency in terms of information provided by monitoring plans)

Procedure	Sec.	Assessment findings
Uncertainty and quality management	9.2	• Establishes appropriate procedures for managing data quality, as required by §4.8.4of VCS Standard • Contains guidance regarding quality assurance/quality control methods that is consistent with Volume 1, Chapter 6 of IPCC 2006 Guidelines
Expert judgment	9.2	• Provides criteria for sourcing values from expert judgment • From review of the VCS Standard, the assessment team agrees that guidance therein is applicable to the methodology and will help to ensure that values are appropriately sourced from expert judgment and updated as appropriate for technological or regulatory changes.
Monitoring of project implementation	9.2	• Monitoring is required to ensure ongoing conformance with the applicability conditions as required by §4.8.4 of VCS Standard • Methodology contains procedures for the required monitoring • Assessment team agrees that procedures for monitoring project implementation are appropriate.

3.10.1 Parameters available at validation

An identification of the data/parameter IRi available at validation, and an assessment of how the information provided for this parameter is appropriate is provided below.

Data / Parameter:	IRi
Data unit	Number
Description	Technology improvement factor for applicable fleet i in year y for default value BE calculations.
Equations	1
Source of data	CDM AMS-III.C which uses the same discount rate in baseline calculations
Value applied	If baselines are calculated using updated BEy parameters for each project year y, IRi = 1 If default values are used for these BEy parameter calculations For LDV applicable fleets, IRi = 1 For HDV applicable fleets, IRi = 0.99
Justification of choice of data or description of measurement methods and procedures applied	If the baseline is calculated each year using the applicable fleet and conventional fleet statistics in each project year y, then no technology improvement rates need to be applied (since annual accurate data is used each year) IRi,y is therefore set to be 1. IRi when applied to LDV projects using default values is 1 because default values for MPG factors use individual, specific MPG figures for each fossil

	fuel vehicle comparable to each EV model in the applicable fleet (see Appendix 1). These MPG figures only change substantially when a fossil fuel model is re-designed/updated by manufacturers which takes place on a 7-10-year cycle: this timeframe is longer than the Verra five-year update cycle for parameter updates. IRi when applied to HDV projects using default values is 0.99 because the defaults values use market-wide, class based comparable MPG factors for default calculations rather than individual, specific MPG figures for the fossil fuel vehicles comparable to each EV model (see Appendix 1) provided that: • This 0.99 improvement rate is applied to each calendar year. • This rate is taken to be 0.99 consistent with the IR default in CDM-III.C. • For project year 1, IR^(y-1) must be 1 (since any number to power 0 is 1).
Purpose of Data	Calculation of baseline emissions
Comments	Data to be updated when the emissions factors are updated
Assessment	The analysis is detailed and provides sufficient choice for the various types of EV chargers

3.10.2 Parameters available at verification

The parameters listed below are available at verification. The parameters were each assessed during this assessment, and an assessment note is provided.

Data / Parameter:	$EF_{j,f,y}$
Data unit	tCO_2 or CO_2e/gallon
Description	Emission factor for the fossil fuel f used by the fossil fuel vehicles deemed comparable to each EV in applicable fleet i in year y
Equations	1
Source of data	Use values from credible international or national government sources such as, for the US, the EPA emissions factor[1].
Value applied	<u>For LDV projects located in the US and Canada:</u> L1/L2 (BEV and PHEV average) = 0.0088 tCO_2 or 0.0088 tCO_2e per gallon DCFC (BEV average) = 0.0088 tCO_2 or 0.0088 tCO_2e per gallon <u>For HDV projects located in the US:</u> e-buses = 0.0102 tCO_2 or 0.0102 tCO_2e per gallon e-trucks = 0.0102 tCO_2 or 0.0102 tCO_2e per gallon

[1] https://www.epa.gov/sites/production/files/2015-11/documents/emission-factors_nov_2015.pdf

	Projects must apply the default value using units (CO_2 or CO_2e) consistent with their project boundary choices, consistent across all project activity sources.
Justification of choice of data or description of measurement methods and procedures applied	International and national government transportation fuel emission rates have been widely established and peer reviewed. US & Canada default values calculated in Appendix 1. Note that if countries provide EF fuel emission factors using slightly different units such as CO_2 per liter simple conversions must be made during validation One common conversation from CO_2 per liter to CO_2 per gallon is given below: CO2 per gallon = CO2 per liter * 3.785 Based upon conversion factors of: 1 gall = 3.785 liters
Purpose of Data	Calculation of baseline emissions
Comments	Calculated annually, based on the fuels consumed by the fossil fuel vehicles deemed comparable to the EV models on the road each year in the applicable fleet, unless default values for baseline calculations for LDVs and/or HDVs are used.
Assessment	The sources for the emissions factor are appropriate and will be updated by the government.

Data / Parameter:	$AFEC_{iy}$
Data unit	kwh/100 miles
Description	Weighted average electricity consumption per 100 miles rating for EVs in applicable fleet i in project year y
Equations	1 and 2
Source of data	Calculated in Equation 2
Value applied	<u>For LDV projects located in the US:</u> L1/L2 (BEV and PHEV average) = 33.32 DCFC (BEV average) = 31.88 <u>For HDV projects located in the US:</u> e-buses = 300 e-trucks = 140 <u>For LDV projects located in Canada:</u> L1/L2 (BEV and PHEV average) = 35.44 DCFC (BEV average) = 33.00

Justification of choice of data or description of measurement methods and procedures applied	Analysis calculations can be found in Appendix 1. Changes in the value of $AFEC_{iy}$ are very gradual over time. Default values for $AFEC_{iy}$ must be updated each 5 years alongside the activity method updates US & Canada default values calculated in Appendix 1.
Purpose of Data	Calculation of baseline emissions
Comments	Calculations for AFEC for open networks (where the exact EV models charging are not known) must be established using such data sources which must be compiled on a national basis (that is, for example, the number of BEV's of each model on the road in the US for open DCFC networks). Calculations for AFEC for closed networks (e.g. where the composition and operating characteristics of both the applicable and comparable fleets are known and documented, such as with transit agency e-bus fleets) may be made using the specific composition of these fleets (that is, for example, EVR must be the number of e-buses on the road for that particular transit agency fleet). For both open and closed networks, the individual EV model's EV ratings (kwh/100 miles) must be used as applicable to the government rating agencies from which they have been sourced, (e.g. nationally for US; supra-nationally for EU), including in the periodic update of default values. Note again that if EVs are rated using slightly different variables such as kwh/100 km in Europe simple conversions must be made during validation. One common conversation from kwh/100km to kwh/100 miles is given below: kwh per 100 miles = kwh per 100km / 0.6215 Based upon conversion factors of: 100 km = 62.15 miles
Assessment	The calculations were reviewed and are correct. The supporting data will be updated from appropriate sources

Data / Parameter:	MPG_{iy}
Data unit	miles per gallon
Description	Weighted average miles per gallon rating for fossil fuel vehicles deemed comparable to each EV in applicable fleet i in project year y

Equations	1 and 3
Source of data	Derived in Equation 3
Value applied	For LDV projects located in the US: L1/L2 (BEV and PHEV average) = 29.18 DCFC (BEV average) = 29.10 For HDV projects located in the US: e-buses = 4.34 e-trucks = 8.60 For LDV projects located in Canada: L1/L2 (BEV and PHEV average) = 29.65 DCFC (BEV average) = 27.71
Justification of choice of data or description of measurement methods and procedures applied	US & Canada default values calculated in Appendix 1 For LDV projects, changes in the value of MPG_{iy} are very gradual over time given that a particular EV model's comparable fossil fuel vehicle rating must remain relatively steady for many years until the vehicle is significantly re-engineered. Thus for LDV projects, the default equivalent MPG's are taken from specific comparable vehicles (rather than classes of vehicles) whose MPG's are only likely to change with major model upgrades (and thus remain static for many years). For HDV projects, the class average MPG has been taken as the source data (see Appendix 1) so the discount rate IR_i of 0.99 must still apply. Default values for MPG_{iy} must be updated each 5 years with the activity method updates.
Purpose of Data	Calculation of baseline emissions
Comments	Consistent with guidance provided in AFEC above, weighted average is calculated for project year y based upon the number of EVs of each EV model type a in applicable fleet i on the road in project year y (EVR_{aiy}) combined with the mile per gallon ratings for each of these EV model's comparable fossil fuel vehicle ($MPG_{a,l,y}$). Calculations for comparable fleet's average MPG for open networks (where the exact EV models charging are not known) must be established using such data sources which must be compiled on a national basis (that is, for example, the number of BEV's of each model on the road in the US for open DCFC networks).

	Calculations for these fleet's MPG for closed networks (e.g. where the composition and operating characteristics of both the applicable and comparable fleets are known and documented, such as with transit agency e-bus fleets) may be made using the specific composition of these fleets (that is, for example, EVR must be the number of e-buses on the road for that particular transit agency fleet). For HDV closed networks, if the composition and operating characteristics of both the applicable and comparable fleets are known and documented (e.g. for transit agency EV charging infrastructure where the MPG's for the agency's own baseline bus operations can be established as the agency's comparable fleet of fossil fuel buses) using any of the CDM AMS-III.C Approach 1, Options 1 – 5, paragraphs 32 - 37. For both open and closed networks, the individual fossil fuel model's MPG ratings must be used as applicable to the government rating agencies from which they have been sourced (e.g., nationally for US; supra-nationally for EU), including in the periodic update of default values. MPG_{iy} is calculated annually unless the default values for baseline calculations for LDVs and/or HDVs is used following Equation 4, which employs the default value $DMPG_{iy}$. US & Canada default values calculated in Appendix 1. If standard emission values are provided using different parameters (such as CO_2/km as fossil fuel vehicle emission factors in Europe) conversions to given variable units will be made. One common conversation from liters per 100 km to miles per gallon is given below: MPG = 235.24 / liters per 100 km Based upon conversion factors of: 1 gall = 3.785 liters 100 km = 62.15 miles
Assessment	The calculations were reviewed and are correct. The supporting data will be updated from appropriate sources

Data / Parameter:	EV_{aiy}
Data unit	kwh/100 miles

Description	Electricity kwh consumption per 100 miles rating for EV model a within applicable fleet i in project year y
Equations	2
Source of data	Use values from credible national governmental sources such as the ratings for the US provided by US DoE Fuel Economy program[2].
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	National, governmental ratings provide independent third party public source.
Purpose of Data	Calculation of baseline emissions
Comments	See guidance for AFEC above. For both open and closed networks, the EV_{aiy} ratings must be used as applicable to the government rating agencies from which they have been sourced, e.g. nationally for US; supra-nationally for EU.
Assessment	The data used are from well-reviewed public sources and are appropriate

Data / Parameter:	EVR_{aiy}
Data unit	Cumulative number of EVs
Description	Total number of EV model a within applicable fleet i on the road by project year y
Equations	2 and 3
Source of data	Use values from credible national governmental sources such as the statistics provided for the US provided by the Argonne National Laboratory's monthly email updates[3] Closed networks may also use the number of EV's on the road using their known composition and operating characteristics of the applicable fleets they serve.

[2] https://www.fueleconomy.gov/feg/evsbs.shtml

[3] Such as the *U.S. E-Drive vehicle monthly updates_February 2017* provided via email by ANL. The main ANL web link is found here including the email address for the database manager: https://www.anl.gov/energy-systems/project/light-duty-electric-drive-vehicles-monthly-sales-updates

[3] https://www.fueleconomy.gov/feg/pdfs/guides/FEG2016.pdf

Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	Argonne National Laboratory is an independent, trusted government source of EV data for the US market.
Purpose of Data	Calculation of baseline emissions
Comments	This value is calculated for project year y based upon the cumulative number of EVs of each EV model type a in applicable fleet i on the road by project year y, consistent with AFEC guidance above. In the USA, statistics for the number of EVs on the road by model type is available from several sources including Argonne National Laboratory, in their monthly emails[4], which draws upon data from hybridcars.com[5].
Assessment	The data used are from well-reviewed public sources and are appropriate.

Data / Parameter:	$MPG_{a,I,y}$
Data unit	miles/gallon
Description	Mile per gallon rating for fossil fuel vehicle model(s) deemed comparable to EV model a from applicable fleet i in project year y
Equations	3
Source of data	See guidance for MPG_{iy} above. Use values from credible national government sources such as the US rating found in the 2016 Fuel Economy Guide[6] For both open and closed networks, the $MPG_{a,I,y}$ ratings must be used as applicable to the government rating agencies from which they have been sourced (e.g., nationally for US; supra-nationally for EU.)

[4] See U.S. E-Drive vehicle monthly updates_February 2017 provided via email by ANL. https://www.anl.gov/energy-systems/project/light-duty-electric-drive-vehicles-monthly-sales-updates

[5] Argonne National Lab's (ANL) monthly emails uses data sourced from the hybridcars.com web site: http://www.hybridcars.com/december-2016-dashboard/ The main ANL web link is found here including the email address for the database manager: https://www.anl.gov/energy-systems/project/light-duty-electric-drive-vehicles-monthly-sales-updates

[6] https://www.fueleconomy.gov/feg/pdfs/guides/FEG2016.pdf

Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	National governmental ratings such as those found in the US Fuel Economy Guides for the US market are independent, trusted government sources of fuel consumption ratings.
Purpose of Data	Calculation of baseline emissions
Comments	If standard emission values are provided using parameters which already incorporate fuel emission factors such as CO_2/km ratings for fossil fuel vehicle emission factors in Europe then conversions to the appropriate combination of variables must be made to establish equivalence to the parameters in these equations. For example, in Europe, fossil fuel vehicle are rated in terms of CO_2 per km (given here as EFEU). Therefore, if the EV ratings are still given as kwh per 100 miles, then such a conversion would be: CO_2 per mile = $EF_{j,f,y}$ / $MPG_{a,l,y}$ = EFEU / 0.62.
Assessment	The data used are from well-reviewed public sources and are appropriate.

Data / Parameter:	$ECD_{i,y}$
Data unit	Kwh/year
Description	Quantity of electricity delivered to EV's by project chargers serving applicable fleet i in project year y
Equations	1
Source of data	kwh delivered to EV's for project charging network using systems' actual or estimated kwh values, as below. Note that for L2 chargers, the electricity delivered, ECD, will be considered the same as electricity consumed by the chargers EC since L2's are highly efficient chargers with de minimis losses due to their own power consumption. (i.e. ECD = EC) For DCFC, baseline emission calculations must use ECD which must be based upon the kwh delivered to the EV's which is what the chargers' own internal smart DCFC's meter measure. (By contrast, for project emissions measurements which are based on the electricity consumed by the DCFC (where efficiency losses can be more material) kwh data can be sourced either A) from this ECD provided that a DCFC efficiency factor is applied or B) from kwh data metered on the grid-side of the charging system and any

	associated AI. See EC, ECTOD, NEC and NECT parameter boxes below for PE applications.)
Value applied	Measured value based on kwh delivered by charging systems in year y
Description of measurement methods and procedures to be applied	The kwh delivered by the charging systems for each applicable fleet i must be sourced using the following hierarchy, where projects must apply first those listed highest on the list: 1) Actual kwh sourced using smart charger measurement systems or (for L2's only) on-site grid electricity meters 2) Estimates for a project's dumb network charger segments based upon the portions of the project which has available such smart network project averages or utility-style project user survey data applicable to these same segments (e.g. for each applicable fleet across comparable segments (public, workplace, residential etc)) 3) Investments to upgrade chargers to provide actual "smart" data results by installing technologies which effectively retrofit metering[7] 4) Use of reasonable regionally applicable pilot project data (such as local utility project results) for non-metered project chargers that don't have smart actual measurements when this pilot data reasonably corresponds to comparable utilization rates to those in the project 5) In the US, use of the Department of Energy/Idaho National Laboratory's (DoE/INL) EV Project data[8] to apply average kwh per charging event data which is provided across a) different settings (public, residential, non-private residential) and b) for each US state For #2 and 4, validator reviews must consider whether projects are applying "smart"/utility/pilot project data using an appropriate project segmentation basis, so that there is a reasonably comparable basis upon which chargers operate in the "dumb" and "smart" segments. This comparability provides a reasonable basis upon which to apply the representative smart segment averages to the corresponding dumb segments of the project. Such representative estimates must also rather underestimate the

[7] e.g. EMotorWerks Juicebox
[8] https://avt.inl.gov/project-type/ev-project

	quantity of electricity than overestimate it (e.g. by applying a discount factor consistent with available project data). Use calibrated electricity meters/smart charging system measurement systems. Calibration must be conducted according to the equipment manufacturer's specifications.
Frequency of monitoring/recording	Measured actual data must be monitored and recorded on at least an annual basis; monitoring periods for metered data can be consistent with utility reports. Estimated consumption can be made on annual basis from sources which monitor using measured/actual or metered sources per the hierarchy above.
QA/QC procedures to be applied	The consistency of metered electricity consumption should be cross-checked with receipts from electricity purchases where applicable
Purpose of Data	Calculation of baseline emissions
Calculation method:	
Comments	N/A
Assessment	The electricity provider maintains calibrated meters. The data is of known quality and is appropriate.

Data / Parameter:	$EC_{i,y}$
Data unit	Kwh/year
Description	Quantity of electricity consumed by project chargers serving applicable fleet i in project year y
Equations	4
Source of data	kwh consumption for project charging network using systems' actual or estimated kwh values, as below Note that for L2 chargers, the electricity consumed EC will be considered the same as electricity delivered to the EV's by the chargers, ECD, since L2's are highly efficient chargers with de minimis losses due to their own power consumption. (i.e. ECD = EC) For DCFC, EC must be based upon the kwh consumed by the charging system (since efficiency losses can be more material for DCFC's). DCFC EC data can therefore either be sourced via: A) ECD, the chargers' own internal smart DCFC's meter data, provided that a DCFC efficiency factor of 92.3% is applied to the

	smart charger metered data[9] or B) meters which are on the grid-side of the DCFC units/AI If a project can demonstrate to validators a more accurate efficiency factor for their particular DCFC systems (for example due to improvements in DCFC technology efficiencies over time) this updated accurate efficiency factor may be substituted for the 92.3% default efficiency value.
Value applied	Measured value based on kwh consumed by charging systems in year y For DCFC, using approach A, $EC_{i,y} = ECD_{i,y}/0.923$
Description of measurement methods and procedures to be applied	The kwh consumed by the charging systems for each applicable fleet i must be sourced using the following hierarchy, where projects must apply first those listed highest on the list: 6) Actual kwh consumed using smart charger measurement systems or on-site electricity meters 7) Estimates for a project's dumb network charger segments based upon the portions of the project which has available such smart network project averages or utility-style project user survey data applicable to these same segments (e.g. for each applicable fleet across comparable segments (public, workplace, residential etc)) 8) Investments to upgrade chargers to provide actual "smart" data results by installing technologies which effectively retrofit metering[10] 9) Use of reasonable regionally applicable pilot project data (such as local utility project results) for non-metered project chargers that don't have smart actual measurements when this pilot data reasonably corresponds to comparable utilization rates to those in the project 10) In the US, use of the Department of Energy/Idaho National Laboratory's (DoE/INL) EV Project data[11] to apply average kwh per charging event data which is provided across a) different settings (public, residential, non-private residential) and b) for each US state For #7 and 9, validator reviews must consider whether projects are applying "smart"/utility/pilot project data using an appropriate project segmentation basis, so that there is a reasonably

[9] The 92.3% DCFC efficiency factor is derived from Idaho National Lab powerpoint findings as reviewed with the VVB
[10] e.g. EMotorWerks Juicebox
[11] https://avt.inl.gov/project-type/ev-project

	comparable basis upon which chargers operate in the "dumb" and "smart" segments. This comparability provides a reasonable basis upon which to apply the representative smart segment averages to the corresponding dumb segments of the project. Such representative estimates must also rather underestimate the quantity of electricity than overestimate it (e.g. by applying a discount factor consistent with available project data). Use calibrated electricity meters/smart charging system measurement systems. Calibration must be conducted according to the equipment manufacturer's specifications.
Frequency of monitoring/recording	Measured actual data must be monitored and recorded on at least an annual basis; monitoring periods for metered data can be consistent with utility reports. Estimated consumption can be made on annual basis from sources which monitoring using measured/actual or metered sources.
QA/QC procedures to be applied	The consistency of metered electricity consumption should be cross-checked with receipts from electricity purchases where applicable
Purpose of Data	Calculation of baseline and project emissions
Calculation method:	
Comments	N/A
Assessment	The equipment manufacturer maintains calibrated meters. The data is of known quality and is appropriate.

Data / Parameter	$EFkw_{i,j,y}$
Data unit	tCO_2e/kwh
Description	Emission factor for the electricity sourced from region j consumed by project chargers serving applicable fleet i in year y
Equations	4
Source of data	Use credible government data sources such as, for the US, the regional eGRID emission factors published by EPA[12]
Description of measurement methods and procedures to be applied	The emission factor must be consistent with the region j from which electricity is sourced (e.g. for the US with the utility's eGRID region[13]).

[12] https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid
[13] https://www.epa.gov/sites/production/files/2017-02/documents/egrid2014_summarytables_v2.pdf

	Published utility specific emission factors are allowed for the kwh consumed from that source consistent with VCS practices which allow well documented more local electricity sources' GHG emission factors to be applied. Average emission factors (not marginal) must be used Grid-sourced and dedicated renewable kwh is treated as having zero tCO2e/kwh. Biogenic sources used on-site to generate electricity are considered dedicated renewables. Other on-site biofuels used to generate electricity must apply and justify their own emission factors for the biofuel used, such as those referenced in the same EPA source from which the other fuel emission default factors (EF) were derived[14].
Frequency of monitoring/recording	Annual updates from these published sources
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method:	Look up value
Comments:	Region j represents any region from which electricity is sourced, each of which must have a well-documented emissions factor for the electricity provided. For US projects, electricity emissions must be estimated using the EPA regional eGRID emission rates, unless other more accurate local/regional sources are available (e.g. from utilities directly serving the charging network).
Assessment	The data used are from well-reviewed public sources and are appropriate.

Data / Parameter	$ECTOD_{i,j,t,y}$
Data unit	Kwh/time period t
Description	Quantity of electricity consumed by project chargers sourced from region j serving applicable fleet i during time of day period t in project year y
Equations	5

[14] https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf

Source of data	kwh consumption for project charging network using systems' actual values provided these are generated using time-of-day metering The same guidance provided for $EC_{i,y}$ relative to the sources of data for L2 and DCFC apply here. So L2 data can be sourced from kwh measured as delivered to EV's or consumed by the chargers since efficiency losses are de minimis. And DCFC data may either be sourced via A) DCFC's own internal smart meter systems, provided that a DCFC efficiency factor of 92.3% is applied; or B) meters which are on the grid-side of the DCFC units/AI. Thus again for DCFC, using approach A, the value applied would be $ECTOD_{i,j,t,y}/0.923$ If a project can demonstrate to validators a more accurate efficiency factor for their particular DCFC systems (for example due to improvements in DCFC technology efficiencies over time) this updated accurate efficiency factor may be substituted for the 92.3% default efficiency value.
Description of measurement methods and procedures to be applied	The kwh supplied by the charging systems applying time of day calculations in equation 6 must be sourced as follows: 1. Using actual time-of-day kwh measurements using smart charger measurement systems or on-site electricity meters, capable of recording/monitoring kwh consumption on at minimum an hourly basis 3. Investments to upgrade chargers to provide such time-of-day actual data results are permitted provided they supply comparable hourly reporting Electricity meters' calibration must be conducted according to the equipment manufacturer's specifications.
Frequency of monitoring/recording	Data must be monitored continuously and recorded on at least an hourly basis.
QA/QC procedures to be applied	The consistency of metered electricity generation should be cross-checked with receipts from electricity purchases where applicable
Purpose of data	Calculation of project emissions
Calculation method:	
Comments:	The sum of all such time-of-day time periods, t, must equal 24 in any given full day within the project (i.e. there are no time periods in which electricity is provided but not accounted for within PEy). This is applicable only if PE emissions are to be calculated on a time-of-day basis

Assessment	The electricity provider maintains calibrated meters. The data is of known quality and is appropriate

Data / Parameter	$EFkwTOD_{j,j,t,y}$
Data unit	tCO_2e/kwh
Description	Emission factor for the electricity sourced from region j consumed by project chargers serving applicable fleet i during time of day period t in year y
Equations	5
Source of data	Use credible governmental or regional utility data sources such as, for the US, those published in the US by ISO's which rely upon utilities' hourly fuel consumption figures (e.g. see PJM publications[15]) Time of day estimates for electricity emission factors, $EFkw_{i,j,t,y}$ must be drawn from credible, applicable sources (e.g. the regional ISO or applicable utility generation sources).
Description of measurement methods and procedures to be applied	If $EFkwTOD_{j,j,y}$ has already been published by utilities in region j on an hourly basis, then these figures must be used. Since hourly EFkwTOD publications may not readily be available, if in region j utilities or ISOs are publishing time of day emission factors on a basis other than hourly, then projects may use this other basis provided it is accepted by validators as reasonable (for example PJM publishes on-peak and off-peak emission factors) in order to accommodate ISO/utility gradual improvements in best practices for time of day emission factor reporting[16]. If in region j, the ISO provides fuel consumption data on an hourly basis, $EFkwTOD_{j,j,y}$ may be estimated on a weighted average basis using equation 6 Grid-sourced and dedicated renewable kwh is treated as having zero tCO2e/kwh Biogenic sources used on-site to generate electricity are considered dedicated renewables. Other on-site biofuels used to generate electricity must apply and justify their own emission factors for the biofuel used, such as those referenced in the same

[15] http://www.monitoringanalytics.com/data/marginal_fuel.shtml

[16] There are no utility/ISO EFkw hourly published rates yet available (only fuel consumption rates) but as the PJM on-peak/off-peak publications indicate such TOD rates will become more accessible over time

	EPA source from which the other fuel emission default factors (EF) were derived[17].
Frequency of monitoring/recording	Source data (for emission factor $EFkwTOD_{j,j,y}$) must be monitored continuously and recorded on at least an hourly or prevailing best practice basis.
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method:	If $EFkwTOD_{j,j,y}$ is estimated using hourly fuel consumption reports (e.g. from an ISO), the weighted average calculations are given in equation 6
Comments:	The sum of all such time-of-day time periods, t, must equal 24 in any given full day within the project (i.e. there are no time periods in which electricity is provided but not accounted for within PEy). This is applicable only if PE emissions are to be calculated on a time-of-day basis
Assessment	The data used are from well-reviewed public sources and are appropriate

Data / Parameter	$EFkwF_{j,j,t,f,y}$
Data unit	tCO_2e/kwh
Description	Emission factor applicable for the fuel type f used to generate the kwh during time of day period t sourced from region j consumed by project chargers serving applicable fleet i in year y
Equations	6
Source of data	Use credible governmental or regional utility data sources such as, for the US, those published in the US by ISO's which rely upon utilities' hourly fuel consumption figures (e.g. see PJM publications[18])
Description of measurement methods and procedures to be applied	If in region j, the ISO provides fuel consumption data on an hourly basis, $EFkwF_{j,j,t,f,y}$ may be estimated on a weighted average basis using equation 6 as follows: • Projects must combine the hourly fuel consumption figures (typically given as the percentage of each type of fuel consumed that hour (50% coal, 50% natural gas)) with the

[17] https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf
[18] http://www.monitoringanalytics.com/data/marginal_fuel.shtml

	emission factors for these same fuels to create a weighted average emission rate for each hourly period. • Emission rates for each fuel must be drawn from the same (e.g. the ISO) or consistent publication sources for region j (noting that these need not be generated on an hourly basis but must be updated on at least an annual basis)
Frequency of monitoring/recording	Each fuel's emission rate need not be generated on an hourly basis but averages must be generated on at least an annual basis.
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method:	
Comments:	Applicable only if PE emissions are to be calculated on a time-of-day basis using utility/ISO hourly fuel consumption inputs
Assessment	The data used are from well-reviewed public sources and are appropriate.

Data / Parameter	$F\%_{ijtfy}$
Data unit	%
Description	Percentage of fuel type f used to generate the kwh DURING EACH time of day period t, sourced from region j and consumed by project chargers serving applicable fleet I in year y
Equations	6
Source of data	Use credible governmental or regional utility data sources such as, for the US, those published in the US by ISO's which rely upon utilities' hourly fuel consumption figures (e.g. see PJM publications[19])
Description of measurement methods and procedures to be applied	The hourly fuel consumption figures are typically given as the percentage of each type of fuel consumed that hour (50% coal, 50% natural gas)).
Frequency of monitoring/recording	This fuel sourced parameter data must be monitored and recorded on at least an hourly basis.

[19] http://www.monitoringanalytics.com/data/marginal_fuel.shtml

	Since the emission factors for each fuel type f need not be generated on an hourly but can be supplied on an annual basis, the percentage of each fuel type f used to generate the kwh during each time period will be supplied for each such time period.
QA/QC procedures to be applied	Typically a look up value
Purpose of data	Calculation of project emissions
Calculation method:	
Comments:	Applicable only if PE emissions are to be calculated on a time-of-day basis using utility/ISO hourly fuel consumption inputs
Assessment	The information is available from the electricity service provider and will be documented appropriately.

Data / Parameter	$NEC_{i,j,s,y}$
Data unit	kwh/year
Description	Electricity consumed by project chargers supplied from associated infrastructure source s net of any kwh EV/charger returned to this same source within region j serving applicable fleet i in project year y
Equations	7
Source of data	Net kwh consumption/generation for project chargers must be secured for each associated infrastructure source (whether derived from the grid, dedicated renewables or the on-site battery) as actual net kwh values using chargers' adequate metering systems The same core guidance provided for $EC_{i,y}$ relative to the sources of data for L2 and DCFC apply here. So L2 data can be sourced from kwh measured as delivered to EV's by the charger meter or as the kwh consumed by the chargers from a grid-based source since losses are de minimis. And DCFC data may either be sourced via A) DCFC's own internal smart meter systems capable of differentiating the net kwh delivered to the EV's from each source s, provided that a DCFC efficiency factor of 92.3% is applied; or B) meters which are on the grid-side of the DCFC units/AI for each source s. Thus again for DCFC, using approach A, the value applied would be $NEC_{i,j,s,y}$ /0.923 If project can demonstrate to validators a more accurate efficiency factor for their particular DCFC systems (for example due to

	improvements in DCFC technology efficiencies over time) this updated accurate efficiency factor may be substituted for the 92.3% default efficiency value.
Description of measurement methods and procedures to be applied	Projects must track the net kwh consumption/generation for charging systems from across all potential associated infrastructure sources, s, (whether grid, dedicated renewable sources, on-site battery), net of kwh supplied back from the EV battery to such sources, using the charger's metering system to track such net kwh calculations. To apply equation 7, such net kwh values must be sourced as follows: 1) Using actual kwh consumption and generation measurements using on-site or smart chargers' metering systems, capable of recording/monitoring kwh both consumed and generated on at minimum a yearly basis 2) Investments to upgrade chargers to provide such net metered actual data results are permitted provided they supply comparable reporting Associated infrastructure sources, s, for which NEC is calculated include: • grid-connected electricity from region j • and/or dedicated renewable energy generated on-site (including RE sourced from direct transmission lines) • and/or the EV vehicle's on-board battery Each of the grid and renewables sources, s, must have a well-documented emissions factor for the electricity sourced and/or dispatched Project metering systems' calibration must be conducted according to the equipment manufacturer's specifications. Projects must incorporate adequate metering systems when applying Eq 7. Guidance for the design/application of such metering systems is provided in Appendix 2.
Frequency of monitoring/recording	Measured actual data must be monitored and recorded on at least an annual basis. Monitoring periods for metered net data can be consistent with reports which the charging systems' metering system provides.
QA/QC procedures to be applied	The consistency of net metered electricity generation should be cross-checked with receipts and invoices from electricity purchases and sales where applicable
Purpose of data	Calculation of project emissions

Calculation method:	
Comments:	The charging system's metering system must adequately and accurately measure and traces such electricity deliveries and receipts from these associated infrastructure sources, (including for example electricity sourced from/returned to the grid, on-site/dedicated renewables, on-site batteries, EV batteries). Applicable only if PE emissions are to be calculated on a net metered basis integrating multiple associated infrastructure sources, s. Note: time of day, hourly monitoring of EV charging/associated infrastructure deliveries and receipts is not a necessary requirement to apply Equation 7. For combined associated infrastructure metering and time of day PE estimates, see parameters for equation 9.
Assessment	The equipment manufacturer maintains calibrated meters. The data is of known quality and is appropriate.

Data / Parameter	$EFkwAI_{i,,j,s,y}$
Data unit	(tCO_2e/kwh)
Description	Emission factor for the net electricity from each associated infrastructure source s within region j consumed by project chargers serving applicable fleet i in year y
Equations	7
Source of data	Each of associated infrastructure source, s, must have a well-documented emissions factor for the electricity it supplies and/or dispatches as follows: • Grid-connected electricity from region j must follow the same procedures as for parameter $EFkw_{i,j,y}$ in Equation 4 (see above) • Dedicated renewable energy generated on-site, including renewable energy sourced via direct transmission lines, must set emission factors at zero • On-site storage batteries must assume the weighted average emission factor based upon the proportionate net consumption of grid and dedicated renewable energy at the charging system (see equation 8)
Description of measurement methods	For grid-connected electricity, see procedures for parameter $EFkw_{i,j,y}$ in Equation 4

and procedures to be applied	For dedicated renewables, emission factors are set at zero. For on-site storage batteries, the calculations are given in equation 8. Projects must incorporate adequate metering systems when applying Eq 7 and 8. Guidance for the design/application of such metering systems is provided in Appendix 2.
Frequency of monitoring/recording	Annual, per procedures for parameter $EFkw_{i,j,y}$ in Equation 4
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method:	For on-site batteries see equation 8
Comments:	Applicable only if PE emissions are to be calculated on a net metered basis integrating multiple associated infrastructure sources, s. Note: time of day, hourly monitoring of EV charging/associated infrastructure deliveries and receipts is not a necessary requirement to apply Equation 7. For combined associated infrastructure metering and time of day PE estimates, see parameters for equation 9.
Assessment	The data used are from well-reviewed public sources and are appropriate.

Data / Parameter	$LEC_{j,,j,y}$
Data unit	kwh/year
Description	Electricity provided to the grid and/or building from on-site storage battery within region j serving applicable fleet i in project year y (kwh/year)
Equations	7
Source of data	From on-site battery/charging system's adequate measurement systems
Description of measurement methods and procedures to be applied	LEC arises if on-site batteries provide kwh back to the grid or local building (for example if used as back up generators/sources of power). These kwh are not supplied to the EV charging system and do not result in EV miles drive and so are deducted out in Eq 7.

	Projects must incorporate adequate metering systems when applying Eq 7. Guidance for the design/application of such metering systems is provided in Appendix 2. Project metering systems' calibration must be conducted according to the equipment manufacturer's specifications.
Frequency of monitoring/recording	Measured actual data must be monitored and recorded on at least an annual basis.
QA/QC procedures to be applied	The consistency of such kwh should be cross-checked with other information sources where applicable
Purpose of data	Calculation of project emissions
Calculation method:	
Comments:	Applicable only if PE emissions are to be calculated on a net metered basis integrating multiple associated infrastructure sources, s. Note: time of day, hourly monitoring of EV charging/associated infrastructure deliveries and receipts is not a necessary requirement to apply Equation 7. For combined associated infrastructure metering and time of day PE estimates, see parameters for equation 9.
Assessment	The calibrated meters are maintained by the electricity service provider and are of known quality.

Data / Parameter	$EFkwonsitebatt_{i,j,s,y}$
Data unit	(tCO_2e/kwh)
Description	Emission factor for the electricity from the on-site batteries as associated infrastructure sources s within region j consumed by project chargers serving applicable fleet i in year y
Equations	8
Source of data	See data sources for Equation 8 variables below
Description of measurement methods and procedures to be applied	The emission factors for the on-site battery as an associated infrastructure source are calculated using the net weighted average of the grid and on-site renewable emission factors given using equation 8 • On-site storage batteries must assume the weighted average emission factor based upon the proportionate net consumption of grid and dedicated renewable energy at the charging system (using equation 8)

	Projects must incorporate adequate metering systems when applying Eq 8. Guidance for the design/application of such metering systems is provided in Appendix 2.
Frequency of monitoring/recording	Annual
QA/QC procedures to be applied	As for equation 8 variables below
Purpose of data	Calculation of project emissions
Calculation method:	
Comments:	Applicable only if PE emissions are to be calculated on a metered basis integrating multiple associated infrastructure sources, s.
Assessment	The data used are from well-reviewed public sources and are appropriate.

Data / Parameter	$ECB_{i,j,z,y}$
Data unit	kwh/year
Description	Electricity consumed by on-site battery from associated infrastructure sources z, which comprise only the grid-connected and dedicated renewable sources, within region j serving applicable fleet i in project year y
Equations	8
Source of data	As for $NEC_{i,j,s,y}$ in equation 7
Description of measurement methods and procedures to be applied	As for $NEC_{i,j,s,y}$ in equation 7 Projects must incorporate adequate metering systems when applying Eq 8. Guidance for the design/application of such metering systems is provided in Appendix 2. In particular, metering systems must need to measure the kwh delivered to the onsite battery from grid and/or renewable sources as distinct from those delivered directly to the EV charger from the grid and/or dedicated renewable sources
Frequency of monitoring/recording	As for $NEC_{i,j,s,y}$ in equation 7
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method:	As for $NEC_{i,j,s,y}$ in equation 7

Comments:	Applicable only if PE emissions are to be calculated on a metered basis integrating multiple associated infrastructure sources, s, when these sources are grid-connected electricity and dedicated renewable energy.
Assessment	The calibrated meters are maintained by the electricity service provider and are of known quality.

Data / Parameter	$EFkwAI\text{-}Z_{j,,j,z,y}$
Data unit	(tCO_2e/kwh)
Description	Emission factor for the electricity from the associated infrastructure sources, z, which comprise only the grid-connected and dedicated renewable sources, within region j consumed by on site battery serving applicable fleet i in year y
Equations	8
Source of data	As for $EFkwAI_{j,,j,s,y}$ for grid connected and renewable energy in equation 7
Description of measurement methods and procedures to be applied	As for $EFkwAI_{j,,j,s,y}$ for grid connected and renewable energy in equation 7 Projects must incorporate adequate metering systems when applying Eq 8. Guidance for the design/application of such metering systems is provided in Appendix 2.
Frequency of monitoring/recording	As for $EFkwAI_{j,,j,s,y}$ for grid connected and renewable energy in equation 7
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method:	As for $EFkwAI_{j,,j,s,y}$ for grid connected and renewable energy in equation 7
Comments:	Applicable only if PE emissions are to be calculated on a metered basis integrating multiple associated infrastructure sources, s, when these sources are grid-connected electricity and dedicated renewable energy.
Assessment	The calibrated meters are maintained by the electricity service provider and are of known quality.

Data / Parameter	$NECT_{i,j,s,t,y}$
Data unit	Kwh/time period t

Description	Electricity consumed by project chargers supplied from associated infrastructure source s net of any kwh EV/charger returned to this same source during time-of-day period t, within region j serving applicable fleet i in project year y
Equations	9
Source of data	Net electricity consumed by project chargers during time-of-day period t from associated infrastructure sources s, within region j serving applicable fleet i in project year y The same core guidance provided for $EC_{i,y}$ relative to the sources of data for L2 and DCFC apply here. So L2 data can be sourced from kwh measured as delivered to EV's by the charger meter or as the kwh consumed by the chargers from a grid-based source since losses are de minimis. And DCFC data may either be sourced via A) DCFC's own internal smart meter systems capable of differentiating the net kwh delivered to the EV's from each source s during time period t, provided that a DCFC efficiency factor of 92.3% is applied; or B) meters which are on the grid-side of the DCFC units/AI for each source s and time period t. Thus again for DCFC, using approach A, the value applied would be $NECT_{i,j,s,t,y}$ /0.923 If a project can demonstrate to validators a more accurate efficiency factor for their particular DCFC systems (for example due to improvements in DCFC technology efficiencies over time) this updated accurate efficiency factor may be substituted for the 92.3% default efficiency value.
Description of measurement methods and procedures to be applied	Follow those for parameters $EC_{i,j,t,y}$ in equation 5 and $NEC_{i,j,s,y}$ in equation 7 Projects must incorporate adequate metering systems when applying Eq 9. Guidance for the design/application of such metering systems, considered as applied to each time period t, is provided in Appendix 2. In addition, for time of day applications of associated infrastructure calculations pertaining to the NECT for an on-site battery's kwh delivered to the EV charger, metering must be applied "upstream", on the grid-side of the on-site battery. That is for the calculation of NECT for an on-site battery, Eq 9 must, using upstream meters, calculate the kwh delivered to EV chargers via the on-site battery from grid and/or dedicated renewable sources during the time of day period t taking into account when these kwh are actually delivered to the on-site battery (not when delivered from this battery to the EV charger) since the GHG impacts for these kwh

	arise on the grid system when they are first delivered into this associated infrastructure system (that is are delivered to the on site battery) For these applications, kwh supplied by the EV to the on-site battery can be set aside (since they return to the EV at a later date) unless, during a given time period t, the LEC less the kwh received by the on site battery from grid and renewable sources less the on-site battery's stored kwh is greater than zero – that is LEC is so large that it must have drawn upon the kwh delivered to the on-site battery from the EV In the context of these NECT calculations for the on-site battery, it should be noted that the kwh supplied from the grid to the EV charging system directly – and those kwh supplied by the EV back to the grid – during any time period t are still considered separately in the calculation of NECT for the grid.
Frequency of monitoring/recording	Follow those for parameters $EC_{i,j,t,y}$ in equation 5 and $NEC_{i,j,s,y}$ in equation 7
QA/QC procedures to be applied	Follow those for parameters $EC_{i,j,t,y}$ in equation 5 and $NEC_{i,j,s,y}$ in equation 7
Purpose of data	Calculation of project emissions
Calculation method:	
Comments:	Follow those for parameters $EC_{i,j,t,y}$ in equation 5 and $NEC_{i,j,s,y}$ in equation 7 Applicable only if PE emissions are to be calculated on a time-of-day basis when also incorporating charging systems' associated infrastructure sources on a metered basis.
Assessment	The calibrated meters are maintained by the electricity service provider and are of known quality.

Data / Parameter	$EFkwTOD\text{-}AI_{i,j,s,t,y}$
Data unit	tCO_2e/kwh
Description	Emission factor for the electricity from associated infrastructure source s within region j consumed by project chargers serving applicable fleet i during time-of-day period t in year y
Equations	9
Source of data	Follow those for parameters $EFkwTOD_{j,,j,t,y}$ in equation 5 and $EFkwAI_{j,,j,s,y}$ in equation 7

Description of measurement methods and procedures to be applied	Follow those for parameters $EFkwTOD_{j,,j,t,y}$ in equation 5 and $EFkwAI_{j,,j,s,y}$ in equation 7 Projects must incorporate adequate metering systems when applying Eq 9. Guidance for the design/application of such metering systems, considered as applied to each time period t, is provided in Appendix 2.
Frequency of monitoring/recording	Follow those for parameters $EFkwTOD_{j,,j,t,y}$ in equation 5 and $EFkwAI_{j,,j,s,y}$ in equation 7
QA/QC procedures to be applied	
Purpose of data	Calculation of project emissions
Calculation method:	Follow those for parameters $EFkwTOD_{j,,j,t,y}$ in equation 5 and $EFkwAI_{j,,j,s,y}$ in equation 8
Comments:	Follow those for parameters $EFkwTOD_{j,,j,t,y}$ in equation 5 and $EFkwAI_{j,,j,s,y}$ in equation 8 Applicable only if PE emissions are to be calculated on a time-of-day basis when also incorporating charging systems' associated infrastructure sources on a net metered basis.
Assessment	The data used are from well-reviewed public sources and are appropriate.

Data / Parameter	$LECT_{j,,j,t,y}$
Data unit	kwh/time period t
Description	Electricity provided to the grid and/or building from on-site storage battery during time-of-day period t within region j serving applicable fleet i in project year y (kwh/year)
Equations	9
Source of data	From on-site battery/charging system's adequate measurement systems
Description of measurement methods and procedures to be applied	Project metering systems' calibration must be conducted according to the equipment manufacturer's specifications. Projects must incorporate adequate metering systems when applying Eq 9. Guidance for the design/application of such metering systems, considered as applied to each time period t, is provided in Appendix 2.
Frequency of monitoring/recording	Measured actual data must be monitored and recorded on at least an annual basis.

QA/QC procedures to be applied	The consistency of such kwh should be cross-checked with other information sources where applicable
Purpose of data	Calculation of project emissions
Calculation method:	
Comments:	Applicable only if PE emissions are to be calculated on a net metered basis integrating multiple associated infrastructure sources, s.
Assessment	The calibrated meters are maintained by the electricity service provider and are of known quality.

Data / Parameter	$EFkwTODonsitebatt_{i,j,s,t,y}$
Data unit	tCO_2e/kwh
Description	Emission factor for the electricity from the on-site battery during time-of-day period t (both on-site infrastructure and EV on-board batteries) associated infrastructure source s within region j consumed by project chargers serving applicable fleet i in year y
Equations	9
Source of data	See data sources for Equation 8 variables above
Description of measurement methods and procedures to be applied	The emission factors for one associated infrastructure source -- for the on-site battery -- are calculated using the net weighted average of the grid and on-site renewable emission factors given using equation 8, but this time applied for each time-of-day period t • On-site storage battery must assume the weighted average emission factor based upon the proportionate net consumption of grid and dedicated renewable energy at the charging system (using equation 9 applied during each time of day period basis) Projects must incorporate adequate metering systems when applying Eq 9. Guidance for the design/application of such metering systems, considered as applied to each time period t, is provided in Appendix 2.
Frequency of monitoring/recording	Consistent with the practices applied for monitoring the $EFkwTOD\text{-}AI_{i,j,s,t,y}$ in equation 9
QA/QC procedures to be applied	As for equation 8 variables
Purpose of data	Calculation of project emissions
Calculation method:	

Comments:	Applicable only if PE emissions are to be calculated on a metered basis integrating multiple associated infrastructure sources, s, on a time-of-day basis.
Assessment	The data used are from well-reviewed public sources and are appropriate.

Data / Parameter	D_y
Data unit	%
Description	Discount factor to be applied in year y
Equations	10 and 11
Source of data	See data sources for data parameters in equation 13
Description of measurement methods and procedures to be applied	Discount factor applied if credits have been issued in the project region for EV fleet credits (e.g. using the CDM AMS-III.C EV fleet methodology)
Frequency of monitoring/recording	Annual
QA/QC procedures to be applied	
Purpose of data	Calculation of emission reductions
Calculation method:	Look up value
Comments:	If there are no EV fleet credits issued in the project region, D_y must be 1 (ie there is no discount applied). Private networks can also demonstrate that D = 1 if there is no access to chargers beyond a defined set of EV's for which it can be demonstrated that no EV fleet credits have been issued. See guidance in section 8.4 regarding open and closed networks. If fleet credits have been issued for a region larger than the proposed EV charging project (e.g. the fleet project is US-wide while the EV charging project is confined to one state), then a sensible pro-rata share of the issued fleet credits can be made (e.g. using the pro-rata number of EV's on the road in the EV charging project state compared to the total in the US, using sources such as ZEVFacts.com).
Assessment	The data and calculations were reviewed and are appropriate

Data / Parameter	ERC_y
Data unit	tCO_2e
Description	Sum of all EV charging projects' credits (whether via this project or others) across all this project's applicable fleet i categories issued within the total project region in project year y-1
Equations	11
Source of data	VCS (and other voluntary and regulated credit registries if they develop similar EV charging methodologies), with EV charging system credits issued within this same project's region (e.g. for complementary charging networks)
Description of measurement methods and procedures to be applied	Simple tallies of the total VCS EV charging systems' credits issued from project year 1 through year y-1 within this project's region EV charging system credits are those issued under this VCS charging methodology (or similar ones developed by other certification groups) whose credits arise within the same region as this project but cover credits issued from complementary charging network systems (e.g. workplace chargers from a complementary project located in the same region as this project's residential chargers).
Frequency of monitoring/recording	Annual
QA/QC procedures to be applied	
Purpose of data	Calculation of emission reductions
Calculation method:	Look up values
Comments:	N/A
Assessment	The data will be available via a project registry and the calculation is appropriate.

Data / Parameter	ERF_y
Data unit	tCO_2e
Description	Sum of all EV fleet projects' credits issued (from other projects using other EV fleet-based methodologies) for these same applicable fleet i categories located within this project's total region, in project year y-1
Equations	11

Source of data	VCS and other voluntary and regulated credit registries, with EV fleet-based credits issued within the project region
Description of measurement methods and procedures to be applied	Simple tallies of the total EV fleet credits issued within this project's region from project year 1 through year y-1 EV fleet credits are those issued under EV fleet methodologies such as CDM AMS-III.C whose credit potentially double count with those issued through EV charging system certified projects.
Frequency of monitoring/recording	Annual
QA/QC procedures to be applied	
Purpose of data	Calculation of emission reductions
Calculation method:	
Comments:	If fleet credits have been issued for a region larger than the proposed EV charging project (e.g. the fleet project is US-wide while the EV charging project is confined to one state), then a sensible pro-rata share of the issued fleet credits can be made (e.g. using the pro-rata number of EV's on the road in the EV charging project state compared to the total in the US, using sources such as ZEVFacts.com).
Assessment	The data will be available via a project registry and the calculation is appropriate.

4 ASSESSMENT CONCLUSION

The SCS assessment team concludes that the Methodology for Electric Vehicle Charging Systems (v. 1.1) and the Activity Method for Determining Additionality of Electric Vehicle Charging Systems (v. 1.1.) adhere to the methodology assessment criteria established in the VCS standard. SCS concludes without qualifications or limitations that the Methodology for Electric Vehicle Charging Systems (v. 1.1) the Activity Method for Determining Additionality of Electric Vehicle Charging Systems (v. 1.1.) meet the requirements of the VCS Program Guide, VCS Standard, VCS Guidance Standardized Methods, and the VCS Methodology Approval Process. As a result, SCS recommends that VCSA approve the methodology as prepared by CNBN.

5 REPORT RECONCILIATION

This section is not applicable since Verra agreed that only a first assessment by a VVB is needed for this methodology and activity method.

6 EVIDENCE OF FULFILMENT OF VVB ELIGIBILITY REQUIREMENTS

The following evidence of fulfilment of SCS' eligibility requirements is presented in accordance with Section 5.2 of the Methodology Approval Process.

SCS has completed ten project validations under ANSI sectoral scope 1 and 2 (fuel consumption, industrial processes). This methodology falls under Verra sectoral scopes 1 and 7 (Energy, Transport) which fall under ANSI sectoral scopes 1 and 2, respectively. A summary of the first ten project validations performed by SCS is as follows:

Project and Project ID	**Date validation report issued**	**Name of GHG program under which project registered**
Giant Eagle Infra-Red Automatic Refrigerant Leak Detection Efficiency Project, VCS440	27 March 2013	Verified Carbon Standard
Improvement in Vehicle Efficiency at Crete Carrier, ACR207	24 Aug 2014	American Carbon Registry
Improvement in Vehicle Efficiency for Marten Transport, ACR204	24 Aug 2014	American Carbon Registry
SOU/UIC LEED Buildings Clean Energy Efficiency Group Project, VCS1436	30 June 2015	Verified Carbon Standard
University of Illinois Urbana-Champaign Campus Wide Clean Energy & Energy Efficiency Project, VCS1407	21 March 2016	Verified Carbon Standard
EOS HFC 310, ACR310	21 March 2016	American Carbon Registry
Replacement of SF_6 as a Cover Gas at US Magnesium, ACR261	3 April 2016	American Carbon Registry
Transformer Oil Reclamation Project, ACR223	29 July 2016	American Carbon Registry
University of Wisconsin Milwaukee Campus Wide Clean Energy & Energy Efficiency Project, VCS1675	29 August 2017	Verified Carbon Standard
Whirlpool HFO Amana 362, ACR362	21 March 2018	American Carbon Registry

The identity and role of the VCS experts utilized in the course of the assessment are described in Section 2.4 of this report.

7 SIGNATURE

Signed for and on behalf of:

Name of entity: SCS Global Services

Signature: 

Name of signatory: Christie Pollet-Young

Date: 1 August 2018

APPENDIX A

The following tables include all findings issued during the course of the methodology assessment. It should be noted that all language under "Project Personnel Response" is a verbatim transcription of responses provided by the methodology developer.

NCR 1 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.5.6
Document Reference: Activity method: Table 1
Finding: As per the VCS standard, data shall be from a time period that accurately reflects available technologies and/or current practice, and trends, within the sector. The activit method refers to the EV market share (annual sales) in the period 2008-2015 as reported for selected countries in the IEA EV Global EV Outlook 2016 Although the latest data is from 2015, the market share data trends from 2008 to 2015 show that the EV market share, while increasing from year to year, will remain below 5% for at least the next five years. The exception, however, is Norway, which already in 2015 had a market share of 2.6% (share of registered vehicles). More recent data shows that the market share (share of registered vehicles) has exceeded 5% (138,829 EVs of a total of 2,719,395 cars as per https://www.ssb.no/transport-og-reiseliv/statistikker/bilreg accessed on 12 June 2018). Hence, Norway does no longer meet the requirements to be listed on the positive list.
Project Personnel Response: Norway is not listed for BEV+PHEV applicable fleets-- only for BEV's. From the 2015 data given in our module footnote (https://www.ssb.no/en/transport-og-reiseliv/statistikker/bilreg/aar/2016-03-30), BEV's at 69100 were 2.6% of total private cars. The definition of EV's was given on the page as BEV and NOT PHEV's. So we only listed Norway as eligible for BEV applicable fleets: the data we found and extrapolated for BEV/PHEVs was not fully conclusive. So we left the BEV/PHEV Norway reference open so that projects could present the relevant data at that point in time. VCS staff were open to providing very indirect references in the module to a negative list. SCS's most recent reference comes from the same source as ours: it doesn't expressly define EV's as only BEVs but the figures would suggest this is the case since they have increased from 69k to 138k by 2018. We have checked our original 2016 source which matches that provided for 2018 by SCS and they are from the same Norweigan government agency. The 2016 source does confirm in the "comment box" highlight that the EV's references are BEV's only not PHEVs. SCS has also confirmed that it thinks that the data sources and definitions are comparable between the 2016 and 2018 (we can only read the English edition!). We would therefore agree that Norway should be deleted from the positive list for both the BEV and the BEV/PHEV applicable fleets. Furthermore we think that it would be best If Norway for both BEV and BEV/PHEV were to be listed on a negative list in the module so that everyone can be clear on this and will provide the 2018 link as the footnote reference for Norway in this list. The Appendix A references to Norway will be similarly updated.
Auditor Response: The additional information in the methodology will add clarity. Please revise the version number and date of the activity method - it has not been updated.
Project Personnel Response 2: Version number has been updated for the module
Auditor Response 2: Version number updated to 1.1 of July 2018. The finding is closed.

NCR 2 Dated 18 Jun 2018
Standard Reference: VCS Methodology Template
Document Reference: Methodology: Section 9.1 Data and Parameters Available at Validation
Finding: Section 9.1 is for parameters that will be determined or available at validation, and remain fixed throughout the project crediting period However, for parameters EF, MPG and EVR, the methodology requires values for these parameters to be calculated for project year y based on information for that project year y. Hence, these parameters do not appear to remain fixed throughout the project crediting period and shall be included in section 9.2.
Project Personnel Response: Originally the EV charging meth specified for these parameters default values in section 9.1 and calculated values in section 9.2 which applied to two separate equations. VCS staff combined these equations into one and the parameter boxes remained in section 9.1. We understand that section 9.2 is designed to apply to parameters whose values change each year or parameters where default value would be looked up each year in order to see whether (consistent with VCS 5 year updates) they also have changed. As a result, all of the paramters in section 9.1 with the exception of the technology improvement rate (IR) should be moved to section 9.2 (including not only EF MPG EVR but also EV, AFEC). However, since these same parameters are also used at validation we will provide a sentence at the beginning of section 9.1 to note that these parameters are therefore applied at both validation and verification so that users are clear on this. Since apparently some verifiers if only focused on verification tasks don't read the validation section this seems to be the most conservative approach. So with the addition of this clause, we're happy to move the location of these parameters to section 9.2.
Auditor Response: The change in the methodology will add clarity. Please revise the statement included in section 9.1 ("In addition to the parameters given below, project parameters EF, AFEC, MPG, EV, EVR, MPGa,I,y and ECD, found in section 9.2, are also available at validation") as it is somewhat misleading. While these parameters are available at validation, it is our understanding that M15they need to be monitored and updated as necessary on a yearly basis (including default factors in case they are updated in the methodology).
Project Personnel Response 2: We understand that the concern SCS is raising here is that the referenced parameters are only incorporated in section 9.1 (during validation) as estimates. So since VCS originally included these parameters in section 9.1 but we have now moved them to section 9.2 since they are not fixed values (and thus don't meet the criteria for parameters to be included in section 9.1) we propose including the following text in section 9.1 so that validators are aware of the fact that estimates for these parameter values will be needed at validation. This reference would be clarifying and explanatory since the title for section 9.1 cites data/parameters available at validation - and the estimates for these parameters would need to be available at validation. The new meth text would therefore read: In addition to the parameters given below, estimates for project parameters EF, AFEC, MPG, EV, EVR, MPGa,I,y and ECD, which are found in section 9.2, will also be provided as needed at validation.
Auditor Response 2: The text added to section 9.1 clarifies that only estimates for mentioned parameters are avaiable at validation, while the values used for determining a project's emission reductions will be monitored ex post. Finding is closed.

NCR 3 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 2.1
Document Reference: Methodology: Section 5
Finding: The scope of the VCS Program includes:
1) The six Kyoto Protocol greenhouse gases.
2) Ozone-depleting substances as set out in VCS document ODS Requirements.
The project boundary includes other gases as an option. However, the type of these other gases is not specified, and it is thus not demontrated whether these other gases are within the scope of the VCS Program
Project Personnel Response: This table follows VCS's own formatting as laid out in their templates. Other gases would therefore only apply to gases within the VCS program. Pragmatically speaking, there are no ODS involved in EV charging. Of the six Kyoto gases, it's only the contribution from N2O and CH4 which is salient -- and even this is extremely modest compared to the CO2. However we understand that the table as current presented suggests that "other gases" are optional -- when in fact no such gases are applicable. So we would propose stating in the box that other gases are 'not applicable" so that this is clear to users.
Auditor Response: For completeness, this modification will add clarity to the methodology. The finding is closed.

NIR 4 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.4
Document Reference: Methodology: Section 5
Finding: The inclusion of CH4 and N2O emissions is optional. However, it is not clear if stated default factors, such as EF (emission factor for fossil fuel used by fossil fuel vehicles) include CH4 and N2O emissions. The methodology needs to clarify this, so that the user of the methodology includes as necessary CH4 and N2O emissions when selecting to apply default factors.
Project Personnel Response: We raised this topic ourselves with the SCS team prior to its review -- and are happy to provide both CO2 and CO2e factors default factors. The CO2e default factors have been provided based upon the same EPA source used for the CO2 fuel emission factors. See https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf The N20 and CH4 emissions (which are calculated on a grams per mile basis) were selected from the appropriate category (LDV, HDV, gasoline, diesel etc) and the average MPG figure for that segment applied to derive a grams per gallon result. The resulting CH4 N2O grams per gallon emission factor was then combined with the g/gall CO2 emission factor after GWP adjustments -- across each of the segmented default fuel emission factors. SCS has copies of the calculations for review and the resulting CO2e emission factors have been included in the methodology appendix and parameter table for EF. The resulting differences were de minimis.
Auditor Response: The additional information adds clarity to the methodology. The finding is closed.

NIR 5 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.4
Document Reference: Methodology: Section 5
Finding: For project emissions the EV battery storage in vehicle is listed. However, section 8.2 does not appear to include any approach for determining project emissions from EV battery storage.
Project Personnel Response: Upon clarification we understand that the concern here is that EV batteries are listed in the project boundary (at VCS's request) but are cited there as a "main source" of emissions when in fact they are a derived source of emissions since the impact of the electricity only arises as a "main source" from the grid or renewables or (on a weighted basis) from these sources stored temporarily in the on site storage battery. So we propose that we amend table 1 in section 5 to cite the EV battery as a "derived" source of emissions and provide an explanatory footnote. That footnote would draw upon the following logic (briefly!) which makes clear why, more broadly, the EV battery is not a separate source nor does it need its own separate emissions factor. The PE's pertaining to V2G using Associated Infrastructure (AI) are calculated by establishing the NET electricity kwh delivered to the EV from each individual AI sources. Thus any kwh return from the EV itself to the grid is netted out in NEC from all the kwh delivered from the grid to the EV -- so that the resulting emission factor is consistent with the source being the grid. Similarly any kwh returned to the on-site battery is netted out in NEC from the kwh delivered to the EV from the on-site battery -- so that the emission factor is consistent with that source, the on-site battery. The on-site battery already takes into account in its emission factor the delivery of renewables within the system but conservatively does not provide adjustments for any RE kwh sent to the EV later returned to the grid or the on-site battery in the grid/onsite battery emission factors. In consultation with VCS staff, EVCCC decided to retain for a methodology extension the ability to earn credits as a result of any onsite renewables which would be delivered back to the grid (through the EV or directly from the RE itself). So the current PE equations do not calculate any incremental GHG benefits arising as a result of any RE in the system returning to the grid. As a result, the accounting system for the AI system (including kwh returned from the EV to grid and on-site battery sources) is conservative since the emission factors are taken to be those of the same source (regardless of whether any kwh from the EV might actually have been renewable). The upgraded treatment of renewables within the AI/EV system ultimately returned to the grid is left for a future methodology extension.
Auditor Response: The amended Table 1 adds clarity to the methodology. The finding is closed.

NCR 6 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.7
Document Reference: Methodology: Section 8.1
Finding: The electricity consumed by the project charging system is suggested to be used for quantifying both baseline and project emissions. While it is adequate to consider the electricity consumed for quantifying project emissions, baseline emissions should be quantified considering the electricity supplied to EVs from the project charging system and thus excluding any losses in the charging system.

Project Personnel Response: EVCCC examined losses to the systems with the VCS staff during their review. Losses for L2 systems are de minimis as measured by Idaho National Labs which estimated the charging systems own consumption of kwh to consistently be an estimated 0.1-1% of that supplied to EVs (see https://avt.inl.gov/evse-type/ac-level-2). Thus VCS agreed that such losses could be set aside as de minimis for both project and baseline emissions. For DCFC, the electricity measured is that delivered to the vehicle using chargers' smart metering systems -- and this is an appropriate basis for the BE calculations. So we have updated the BE equation to clarify that it will measure kwh delivered to the EV's (new parameter ECD) as disinct from the PE kwh parameter EC which remains as defined previously the kwh consumed by the EV chargers. For the BE equation the ECD parameter box gives guidance for where ECD data is to be sourced: for the L2, this can be the L2 charger meter or a grid meter since there are de minimis losses. DCFCs are smart and measure ECD using their on-board meters which measure the kwh delivered to the EVs which is appropriate for the BE equation. Turning now the to measurement of the PE, the equations will need to apply measurement of the kwh consumed by the chargers. For L2, the kwh chargers consume is the same as that delivered to the EVs (ie ECD = EC). However, the project emissions for DCFC's would need to include the kwh needed to run these charger since this may not be as de minimis. So for PE emissions, we propose developing two options for DCFC's which would be applied to the relevant PE equations (EC, ECTOD, NEC and NECT) -- either of which a project could have the choice to apply. Option B is more accurate but requires the ability to have a grid side meters alongside the DCFC smart internal system (ie dual metering) which is not always the case for DCFC sites. So option A applies an "overhead" efficiency factor of 92.3% to account for the kwh consumed by the DCFC's when using kwh reported by their internal smart systems. The 92.3% efficiency factor was similarly obtained from the Idaho National Laboratory testing/powerpoint reports for the DCFC systems. The methodology parameters boxes (and Appendix 2) have therefore been updated to: 1. Clarify application of ECD in BE eq 1. 2. Clarify the sources of data and efficiency factors applied for DCFC (only) in the PE equations, specifically for parameters EC, ECTOD, NEC and NECT as follows: OPTION A: For a DCFC per Idaho National Labs there would be a percentage efficiency rate of 92.3% applied to dispenser--smart-metered total delivered kwh as a charging systems "DCFC consumption factor" applicable only to DCFC in order to derive kwh consumed by the charger. OPTION B: If projects have grid side meters this metered value for the kwh delivered from the grid to the charging system may be taken as the basis for PE in DCFC systems instead of applying the default factor since it would be more accurate. Since DCFC systems efficiencies are likely to improve over time, we have also noted that more accurate efficiency factors may be substituted for the 92.3% default provided these are demonstrated to validators as accurate for a project's particular DCFC systems. CONCLUSION ==>> SEE BOX TO RIGHT DUE TO LACK OF SPACE: We have provided SCS with the INL L2 efficiency examples and their powerpoint summarizing the DCFC efficiency rate. In the meth the simplest clearest way to effect these changes is to a) change the EC in BE Eq 1 to be kwh delivered by the charger to the EV -- as a parameter ECD - with a new parameter box indicating where it's measured ie at the charger dispenser for DCFC and for L2 either the smart charger or other grid based systems since the kwh delivered and consumed are considered the same (given de minimis losses). 2. Retain in the PE equations the EC - as kwh consumed by the charger -- making it clear that for L2 ECD = EC as losses are deminimis; and that for DCFC EC may either A) apply a DCFC % efficiency factor of 92.3% to kwh meter readings taken from the DCFC smart charger itself (which measures kwh delivered to the EV) when estimating PE where kwh consumed by the charger is required; or B) EC will be measured at a grid side meter.
Auditor Response: The explanation is sufficient. The finding is closed.

NCR 7 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.7
Document Reference: Methodology: Section 8.2
Finding: It is understood that an weighted average grid emission factor shall be applied for the emission factor for electricity consumed by the project charging system. However, the methodology does not specify this.
Project Personnel Response: The emission factor the electricity from the grid is intended to be the Average grid emission factor, consistent with the average emission factors provided by EPA as an example of the referenced source. The EFkw given in section 8.2 has its corresponding parameter box in section 9.2. In the EFkw parameter box we state that "Average emission factors (not marginal) must be used ". So we believe this is clear. As an example, the egrid average factor would be its "TOTAL OUTPUT EMSSIONS RATE". So there is already clarity here in the EFkw parameter box . However we have added "average" to the EFkw equation description in section 8.2
Auditor Response: The explanation is sufficient. The finding is closed.

NIR 8 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.7
Document Reference: Methodology: Section 8.1 and 8.2
Finding: The equations for both quantifying project and baseline emissions specify that the emissions should be calculated separately for each applicable fleet i. However, it needs to be clarified how emissions specific to each applicable fleet can be calculated for open networks where the exact EV models charging may not be known and relevant monitoring parameters cannot be associated with a particular applicable fleet.
Project Personnel Response: The original draft of our meth provided all this guidance in the text. This was moved by VCS staff to the parameter boxes. Equations 2 and 3 provided the calculation basis for establishing the weighted average MPG and kwh/100 miles for the applicable fleets if defaults are not going to be used. And the guidance for establishing each parameter in these equations is found in their parameter boxes. The guidance is clear: it requires EV on the road figures for BEV and PHEV to be taken at a national level and government sources for MPG and kwh/100 mile ratings. The requirements for establishing the comparable FF vehicle for each EV model in an applicable fleet is given in the Applicability Conditions. However it seems as if the linkages between the equations 2/3 where there parameters are applied and the guidance for how to apply them in the parameter boxes isn't readily visible to the reader. So we propose adding a clause close to the Eq 2 and 3 to make it clear that if projects are not using default factors then guidance for calculating these equations parameters is found their parameter boxes. NOTE: a worked example was originally supplied with the Appendix which was shared with SCS summarizing the basis for the default calculations for MPG and AFEC. VCS required that this Appendix be removed from the meth as superfluous. However as a worked example, this could be valuable to project developers and validators, particularly those applying BEy each year, so that it can be clearly seen which comparable vehicles, for example, were used in the calculation of the default parameters. It also provides a transparent basis from which the default factors and their assumptions can be updated each 5 years. We therefore asked VCS where they would be in agreement to restore this appendix as a worked example for the default factors and put it back in the meth? Or even publish it separately on the methodology's website? VCS responded to indicate that a worked example spreadsheet would be accepted to develop, replicated the Appendix shared with SCS, and this will be posted to the VCS EV Charging methodology web site. We have therefore replicated and provided this "Default MPG and AFEC Workshop" supplement.
Auditor Response: The additional information provided on the website will add clarity to the methodology. The finding is closed

NCR 9 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.8
Document Reference: Methodology: Section 8.2
Finding: The electricity consumed or supplied by the project charging system may be monitored by measuring actual electricity consumed/supplied using electricity meters. However, section 8.2 also suggests other measurement methods, such as estimates, pilot project data, average kWh per charging event, etc. It is not demonstrated how these methods allow for monitoring with a comparable accuracy than using electricity meters or whether the use of these methods is conservative to ensure that the quantification does not lead to an overestimation of net GHG emission reductions.
Project Personnel Response: The concept note first circulated to VCS included all these measurement and estimate on bases and was accepted as sufficiently accurate and credible from the very outset. We would note that a) conservativeness is ensured with level #5 because the ultimate default parameters are derived from the Idaho National Laboratory's EV Project data which is dates from 2011/13 -- a period when utilization rates were very low, EV's had the smallest batteries and thus kwh delivered would be smaller than current actuals since utilizations rates rise over time and car batteries have got much larger. b) Under # 2 and 4 which allow for the application of comparable smart metered data to be applied to portions/segments of a project's charging units that do not have metered data, the projects have the burden to prove during validation that any project data sourced from such comparable smart systems (under 2 or 4) would reasonably apply as representative comparables to these other parts of their project by establishing that these other chargers operate under comparable circumstances -- and if this is not proven then the more conservative defaults (e.g. EV project data #5) would then be used. That is sensible segmentation analysis needs to be applied across the project portfolio so that smart residential averages are applied to dumb residential segments; smart workplace averages to dumb workplace systems etc; c) the application of smart retrofit technologies (e.g. from watt-time or Emotorworks) effectively creates smart metered data for the charging unit. Thus the cascade of a measurement approaches is designed to promote the practices which would be most accurate -- with the lowest level of defaults has an extremely conservative crediting basis. As a result VCS was sound in its original approvals of this cascade of measurement options from the outset with the EV charging concept note. So to address SCS concerns which relate to the clarity of expression regarding this hierarchy, we have provided: a) data from the EV charging project comparing its utilization levels and kwh consumed per charging event to other contemporary systems to demonstrate that the EV project figures are conservative; b) made it clear in updated wording for the parameter box for #3 that these technologies effectively retroactively install metering which makes the charger "smart"; c) provided clearer language in #2 to inform how the segmentation of applicable smart data is applied to dumb segments alongside an additional note which clarifies briefly that validators would want to confirm whether or not projects were applying comparable segments of "smart' data to comparable segments of "dumb" chargers since the segment averages are reasonable and representative to apply if the smart and dumb systems are operating in comparable situations. We have also provided text responsive to SCS's interests regarding under rather than overestimating the kwh. Otherwise default further down the hierarchy would need to be applied for any chargers for which this comparability cannot reasonably be established.
Auditor Response: The additional information and modifications add clarity to the methodology. The finding is closed.

NCR 10 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.7
Document Reference: Methodology: Section 8.2
Finding: For the emission factor for electricity consumed by the project chargers it is stated that biofuels used on-site to generate electricity are considered dedicated renewables. This would mean that electricity generated from biofuels are assumed to have zero CO2e emissions per kWh. However, biofuels are produced from many sources and multiple processes and the assumption of zero CO2 emissions is not correct as the production of biofuels typically results in CO2e emissions that need to be accounted for.
Project Personnel Response: We agree that not all biofuels are necessarily renewable with zero GHG emission factors. So we will update the clause in this parameter box to confirm that: biogenic sources are considered as renewable but that projects if they include biofuels as other onsite sources from which electricity is generated on-site would need to bring and justify their own emission factor for the biofuel used such as those referenced in the same EPA source from which the other fuel emission default factors were derived (https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf). Thus projects can apply an appropriate and credible emission factor reflecting the kind of biofuel applied (since surplus McDonald's french fry oil might be different to other forms of biodiesel). We have supplied new text referencing biogenic/biofuels for this parameter box
Auditor Response: The additional information provides clarity to the methodology. The finding is closed.

NIR 11 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.5.1
Document Reference: Methodology: Section 8.1
Finding: For the technology improvement factor it is stated that the MPG figures change only when a fossil fuel model is substantially updated by manufacturers which takes place on a 7-10 years cycle. However, within an applicable fleet, the average MPG for the applicable fleet is expected to improve continuously over time as manufacturers carry out fuel efficiency improvements at different point of times and thus the average fuel efficiency improves continuously and not only in steps every 7-10 years. Hence, it is not clear why the improvement factor should be 1.
Project Personnel Response: If projects calculate BE annually then no discount factor is applied (IR=1) since the applicable fleet's comparable fossil fuel fleet's MPG is calculated every year. When default factors are applied in the BE equation, then the following logic applies. The HDV sector applied market sector MPG factors as the comparable basis for all applicable HDV bus and truck fleets. Since this is a market-wide average MPG applying a discount rate is appropriate to take into account the gradual improvement in the overall fleet MPG averages. However the calculation basis for the LDV default values is different. For every individual EV on the road, the comparable fossil fuel (FF) vehicle is established and its MPG determined. Thus each EV-and-its-equivalent-FF-vehicle has a specific MPG and kwh/100 miles: the MPG rating is tailored to each EV model and that comparable FF model will be a reasonable comparable for the limited 5 year window (for which VCS defaults pertain) after which the VCS default factors will be updated. At that time the best comparable FF vehicle and its ratings will be applied -- so if an EV's comparable FF vehicle is no longer produced a new comparable FF vehicle will be established and its MPG used. Thus, given the duration of individual specific vehicles' production lifetimes (10 years) any substantial changes to fuel efficiency will be captured during the 5 year default factor updates. Other LDV MPG changes outside of major updates are confirmed as de minimis via other sources: according to a leading vehicle manufacturer, there can be extremely modest "tweaks" to the MPG of individual models during their 10 year lifespan that can take place outside of any major upgrade. These are estimated at 1% over 10 years, giving an annual improvement rate of 0.25% which would give a discount factor of 99.75% (i.e. 1-0.25%). However, since this is of a completely different order of magnitude to the discount rates applied elsewhere, it is considered de minmis and the IR for LDVs is retained as 1. This is because the default values for LDV are calculated on a a tailored individual vehicle-by-vehicle basis the MPG significant improvements will be captured during the 5 year update -- and any "tweak" MPG improvements would otherwise be considered de minimis VCS only requires that default factors be updated each 5 years and this is reasonable when applied to the review of comparable LDV fossil fuel vehicles in order to capture accurately the major MPG improvements as they arise in such comparable tailored FF vehicles.
The default emission factors will be updated every 5 years and changes in MPG AFEC will be captured then; in the meantime given the otherwise de minimis changes in MPG a discount factor of 1 would be applied for the LDV default factor's IR. VCS reviewed these different bases and also found them reasonable and satisfactory.
Auditor Response: The explanation is sufficient. The finding is closed.

NCR 12 Dated 18 Jun 2018
Standard Reference: VSC Standard 3.7, Section 4.8
Document Reference: Methodology: Section 8.2
Finding: The project year y is not a parameter that needs to be monitored and should thus be removed from section 8.2.
Project Personnel Response: Project year y has featured in other VCS methodologies (e.g the CCEE). EVCCC does not consider that this parameter is defined in ways that are unique to this methodology. EVCCC therefore emailed VCS to ask if it is OK with removing this parameter: VCS agreed so the parameter has been removed.
Auditor Response: The explanation is sufficient. The finding is closed.

OBS 13 Dated 18 Jun 2018
Standard Reference: VCS Standard 3.7, Section 4.8
Document Reference: Methodology: Section 8.2 and Appendix 2
Finding: There is no apparent link between the guidance for design of adequate metering systems in Appendix 2 and the equations for determining project emissions where projects include associated infrastructure in section 8.2. The user friendliness of the methodology should be improved by for example introducing a flow chart which allows the user of the methodology to select the appropriate equations and metering systems depending on the type of associated infrastructure included in a project.
Project Personnel Response: VCS staff dramatically cut down on the length of explanatory test in the PE section concerning AI and adequate metering which was originally included next to all the relevant PE equations. However, we were able to retain introductory clauses for each PE which specify the conditions under which each PE equation applies (and the "provided that" conditions which are essential if the equation is to be applicable). So when Associated Infrastructure (AI) is applicable this is clearly stated in the PE equation introductory clause (see Eq 7, 8, 9). Further explanatory links such as a flow chart VCS will likely consider unfavourably. The Appendix 2 does specify that it applies to adequate metering systems for associated infrastructure (AI) and these are only trigged by PE equations 7,8,9 consistent with their introductory clauses which reference AI. We propose that we make it clear in Appendix 2 that the AI systems are applicable when using equations 7 8 and 9 -- and add references re. Appendix 2 in the text found adjoining Eq 7 and 8 (it is already referenced in the text adjoining Eq 9).
Auditor Response: The modification to Appendix 2 adds clarity to the methodology. The finding is closed.

NCR 14 Dated 18 Jun 2018
Standard Reference:
Document Reference: Methodology: Section 8
Finding: The methodology uses units relevant for the US such as MPG and kWh/100 miles. However, the methodology is also applicable to other countries using the metric system. The user friendliness of the methodology should be improved by providing the necessary conversion factors, both in the text and as an Appendix.
Project Personnel Response: Conversion of the units is referenced in the parameter boxes as the basis to proceed. Simple conversation factors will be supplied for convenience for liters per gallon and kwh/100 km. These are standard factors which project validators can readily check if other conversions are needed An exhaustive list is not appropriate for the methodology given VCS staff's focus on brevity
Auditor Response: The explanation is sufficient. The finding is closed.

NCR 15 Dated 18 Jun 2018
Standard Reference: VCS Standard Section 4.3
Document Reference: Methodology: Section 4
Finding: One of the applicability criteria is that projects with annual emission reductions exceeding 60,000 tCO2e are only permitted if project proponents can demonstrate that the project is located in a country with credible national data sources for GHG emission calculations. However, it is understood that a single charging system will never generate close to 60,000 tCO2e per year. Hence, whether or whether not a project has more than 60,000 tCO2e depends on the number of charging systems that are included in a project. As such, the 60,000 tCO2e limit can easily be circumvented by reducing the number of charging stations that are included in a project. It should thus be evaluated whether the suggested applicability criteria has any relevance.
Project Personnel Response: It was VCS staff which prefered to retain some level of further review for projects in countries where the data quality (e.g. for kwh/100 mile and MPG) might potentially be less accurate. Since it is relatively simple to cross check such vehicles statistics from such countries to OECD statistics in order to ground-truth their reliability, EVCCC also initially proposed that no such small scale project limits be retained. In practice, data sources for MPG and kwh/100 miles would be simple to cross reference to already approved country statistics; the data for the number of EV's on the road wouldn't be readily compared as this is country-specific. However, if VCS agrees with SCS's recommendation here then we would be supportive of this approach. However, absent VCS's concurrence, it will need to be the responsibility of VCS staff (and validators) to address any concurrent multiple project listings of small scale projects from a single region in order to ensure that this "work around" process is addressed. This problem can't be addressed at the level of any individual methodology: it's a VCS system-wide problem. However, currently, the meth allows for large scale projects in any country provided that data sources can be demonstrated to be as of sufficient quaity - so in practice it shouldn't be too hard to establish that large scale project crediting can taken place even in countries not currently automatically confirmed as eligible. Thus through the establishment of data sources as credible for other countries project dvelopers and validators can reach a consensus regarding whether the large scale projects are eligible. We therefore recommend that the current AC text be retained as stated but would like to appreciate the SCS observation since it provides important guidance towards the effective administration of the VCS program where it would be prudent to watch out for repeated submissions of small scale projects from the same region if applied in ways that would otherwise avoid the small scale project limitation. (NOTE: SCS informed us that this comment was mis-classed as an NCR when it had in fact been an OBS)
Auditor Response: The modified explanation in the methodology addresses the finding and adds clarity. The finding is closed.

NCR 16 Dated 18 Jun 2018
Standard Reference: VCS Standard Section 4.3
Document Reference: Methodology : Section 4
Finding: The VCS Standard defines applicability as follows:
[The] Applicability conditions must not contain procedures or obligations upon the project proponent. Rather, they must be conditions against which project eligibility can be determined at the time of validation and must not require the project proponent to undertake ongoing actions to ensure continued eligibility. Section 4, Item 3, 'In order to demonstrate that double counting of emission reduction will not occur: and Item 4, 'Where EV charging system AI is utilized to provide electricity to EVs to store ' are not an applicability condition and should be moved to another section, e.g monitoring.
Project Personnel Response: VCS staff were insistent on all these AC's which also mirror those found in the CDM AMS-IIIC which this methodology is effectively extending. So EVCCC wouldn't want to change the AC's from their current form which would likely get rejected by VCS. Furthermore, the EV charger inventory information doesn't get changed each year (so doesn't form part of annual monitoring) ... certainly new chargers can be added in a grouped project later but again the core double counting provision re. the charger's inventory is established ONCE upfront as the project activity enters the group (not repeatedly each year). From that point it is up to new project developers and their validators to make sure UPFRONT ONCE that they do not include projects with chargers that are already listed in an existing validated projects. It is up to subsequently validated projects to make sure they don't include chargers already included in existing projects' inventories. The same applies to the description of the adequate metering system if AI is included: the description is applied once upfront for project chargers (and later for grouped projects once as new chargers enter) (Note; for grouped projects these AC 'swill also form part of the eligibility criteria so will get applied to new chargers as they are added.) So VCS staff were right to frame these elements as Applicability Conditions since they are addressed once upfront as the project is validated. These items are also cross referenced again in the monitoring plan but for the elements SCS references from these AC's the actions are completed ONCE and upfront during validation. However, we understand that by incorporating these activities again in the monitoring section we may have inadvertently implied that the tasks need to be conducted during each annual review. To be comprehensive, the methodology included both upfront validation activities in the monitoring plan section and annual verification activities. So to be clearer in section 9.3, we propose clustering the Monitoring Plan items into two groups with clear introductory clauses confirming when and how often the actions needs to be completed as follows: 1 Those actions needed only upfront once during validation or entry of new project instances during verification; 2 Those actions completed annually during verification. At the same time, since Applicability Conditions must be framed so that project eligibility can be determined at the time of validation without requiring the project proponent to undertake ongoing actions to ensure continued eligibility, we have slightly rephrased applicability criteria #4 to read: "The methodology is applicable to EV charging systems utilizing AI ... under the condition that....". Since the CDM methodology has a similar applicability criteria as criteria 3, this criteria can't be removed and the phrasing is already clear.
Auditor Response: The modified explanation in the methodology addresses the finding and adds clarity. The finding is closed.

NCR 17 Dated 18 Jun 2018
Standard Reference: VCS Standard Section 4.4
Document Reference: Methodology: Section 8.3
Finding: Please clarify why leakage is not considered an issue under this methodology, and is therefore set at zero. No information was provided in the methodology or supporting data
Project Personnel Response: Since this methodology essentially extends the CDM AMS III.C methodology, its leakage is consistent with the CDM determination. EVCCC considered leakage carefully in its analysis paper (shared with VCS and the SCS co-lead earlier) and concluded that the CDM determination was correct. Any "cross charging" from ineligible chargers in the marketplace will be entirely de minimis. So we propose that in the methodology we cite the CDM precedent and summarize in a couple of sentences why the leakage is indeed de minimis. We have also shared a copy of our cross-charging analysis with SCS on a confidential basis.
Auditor Response: The additional information will add clarity to the methodology. The finding is closed.

NCR 18 Dated 18 Jun 2018
Standard Reference: VCS Standard Section 4.8
Document Reference: Methodology : Section 9.1, 9.2
Finding: For parameter EFj,f,y, and EFkwi,j,y the source of data is the US EPA Emission Factors not the emissions ratings or rates.
Project Personnel Response: We appreciate the nuance here: the text has been updated
Auditor Response: The updated information is sufficient. The finding is closed.

NCR 19 Dated 18 Jun 2018
Standard Reference: VCS Standard Section 4.8
Document Reference: Methodology: Section 9.1
Finding: Footnote 19 and 20 list a project manager at Argonne National Laboratory. The program manager may change but the program continue. The website provides the current information including the program manager and other contacts. The program should be referenced.
Project Personnel Response: The web site is given in the footnote 21. We have copied this also to footnotes 19 and 20
Auditor Response: The updated information is sufficient. The finding is closed.

NCR 20 Dated 18 Jun 2018
Standard Reference: VCS Standard Section 4.8
Document Reference: Methodology: Section 9.2
Finding: Section 9.2, p. 28 item 3 " Investments to upgrade chargers to provide actual "smart" data results e.g. EMotorWerks Juicebox" Examples of companies and products that may or may not be short-lived should be minimized.
Project Personnel Response: To be consistent with the item above which asked for more detail on this #3 in the hierarchy list, we will describe what these technologies achieve (retrofits which give a more accurate reading of the kwh delivered than dumb systems can otherwise provide) but we will move the EMotorWerks Juice box example to a footnote so that projects can still see the kind of technology which we're referring to (some weren't aware of it) but the reference will not be so prominent and thus avoid the "decay" risk over time as technology innovations continue.
Auditor Response: The modification adds clarity to the methodology. The finding is closed.

NCR 21 Dated 18 Jun 2018
Standard Reference: VCS Standard Section 4.8
Document Reference: Methodology: Section 9.2
Finding: Section 9.2, factor EFkwTODj,j,t,y references the marginal factor, not the emissions factor. Please clarify why a marginal factor would be correct and not a specific emissions factor from an ISO.
Project Personnel Response: The parameter box guidance does not specify nor require marginal emission factors consistent with all the EFkw in other parameter boxes. The only reference to "marginal" comes from a footnote which was added for convenience based upon the only US ISO which actually makes public its time of day emission statistics: this ISO -- PJM -- reports its fuel consumption (fuels used to generate electricity each hour) on the basis of the percentage of each fuel burned each hour. There is only one US ISO currently making such publications -- PJM. Its statistics were referenced in the footnote merely for illustrative purposes to be helpful (since it can be very hard to find any such data publicly). We recommend that the footnote be retained. However. for the EFTkwOD we also note that time of day emission factors are only just beginning to be publicly published by ISOs and utilities (PJM for example has an on-peak and off-peak set of emission factors published currently). So we will provide a clarifying note in EFkwTOD to confirm that if such credible ISO/utility data sources provide time of day emission factor day on bases other than hourly they may still be presented by projects for validator consideration and accepted if these are found to be reasonable. This enables the methodology to still be responsive to time of day data as it is published in the future based upon the best practices which ISO and utilities will develop going forward.
Auditor Response: The additional information will add clarity to the methodology. The finding is closed.

OBS 22 Dated 18 Jun 2018
Standard Reference:
Document Reference: Methodology: Appendix 2
Finding: The URL for footnote 30 is non-functional
Project Personnel Response: The reference should be to AMS I F. This is the link: https://cdm.unfccc.int/methodologies/DB/9KJWQ1G0WEG6LKHX21MLPS8BQR7242. The links have been updated in the methodology text.
Auditor Response: The updated information is sufficient. The finding is closed.

OBS 23 Dated 18 Jun 2018
Standard Reference:
Document Reference: Methodology
Finding: Throughout the document qualifiers such as credible or sensible are associated with sources of data or calculations from sources of data, e.g. credible government data sources. This implies that there is also non-credible government data. Antonyms for credible include implausible, improbable, incredible, unbelievable, and unlikely. With the current constant challenge to the integrity of scientific data, especially government information and data, minimization of such qualifiers is encouraged. For instance, government data sources referenced in the methodology are credible.
Project Personnel Response: We understand SCS's concerns here. The terminology reflected VCS staff concern that some government sources in some countries might not be as credible as those in OECD regions. EVCCC wouldn't want to unduly change positive adjectives which VCS may object to if removed -- particularly since this term is used throughout the methodology. So these terms might be best left in place since VCS has already completed its final editing here on this current text :)
Auditor Response: This is an observation not a corrective action. The finding is closed.