

California Air Resources Board

Greenhouse Gas Quantification Methodology for the California Department of Food and Agriculture State Water Efficiency and Enhancement Program DWR (Prop 1) Joint Project

Greenhouse Gas Reduction Fund
FY 2015-16



DRAFT
August 26, 2016

Note: This Draft FY 2015-16 quantification methodology is subject to change in response to public comments. Public comments may be submitted via email to GGRFProgram@arb.ca.gov through September 30, 2016.

DRAFT

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Section A. Introduction

The California Air Resources Board (ARB) is responsible for providing the quantification methodology to estimate greenhouse gas (GHG) emission reductions from projects receiving monies from the Greenhouse Gas Reduction Fund (GGRF) for California Climate Investments. For the California Department of Food and Agriculture's (CDFA) State Water Efficiency and Enhancement Program (SWEEP), ARB staff developed this quantification methodology and the accompanying ARB GHG calculator tool for water supplier applicants to use to estimate the GHG emission reductions from the proposed Department of Water Resources (DWR) joint project. As a subset of the larger SWEEP Program, the joint project focuses on connecting agricultural operations that rely on groundwater pumped on-farm to centralized pressurized irrigation delivery systems. DWR, through Proposition 1 funds, will fund a project to pressurize an irrigation delivery system. CDFA, using SWEEP funds, will incentivize agricultural operations to connect to the pressurized system through grants for water and energy savings, provided the agricultural operations eliminate on-farm pumping.

This methodology uses calculations to estimate reduced energy use and the associated reduction in GHG emissions from the elimination of on-farm pumping in conjunction with centralized irrigation system enhancements. These calculations are based on the current understanding of irrigation practices, project specifications of irrigation system enhancements and fuel conversions, and GHG emission factors.

ARB staff will periodically review each quantification methodology to evaluate its effectiveness and update methodologies to make them more robust, user-friendly, and appropriate to the projects being quantified.

Methodology Development

ARB staff followed a set of principles to guide the development of the quantification methodology. These principles ensure that the methodology for the SWEEP DWR joint project will:

- Apply at the project-level;
- Align with the project types proposed for funding;
- Provide uniform methodologies that can be applied statewide, and be accessible by all applicants;
- Support the analysis of GHG emission reductions from the proposed projects;
- Use existing and proven methods; and
- Use project-level data when available for estimated energy use reductions.

The methodology fits these objectives, and provides a uniform approach to quantify GHG emission reductions in metric tons of carbon dioxide equivalent (MTCO_{2e}).

Tools

Water supplier applicants must use the ARB GHG calculator tool, located at <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/quantification.htm>, to estimate the GHG emission reductions from their proposed SWEEP DWR joint project on behalf of the agricultural operations.

SWEEP DWR Joint Project

This methodology calculates the GHG emission reductions associated with the following activities:

1. Elimination of on-farm pumping
2. Irrigation delivery system enhancements (including pressurization)

[Per SWEEP DWR joint program guidelines:](#)

Eligible projects must:

- Reduce net GHG emissions; and
- Eliminate on-farm groundwater pumping; and
- Reduce on-farm water use.

Applicants must provide supporting documentation directly related to actual on-farm water consumption and GHG emissions.

Note: Projects that reduce water consumption but do not eliminate pumping are not considered an eligible project.

GHG Emission Reductions Quantification Approach

The following metric will be used for ARB reporting purposes to assess the effectiveness of the project to reduce GHG emissions per dollar of GGRF funds and will be reported by the applicant as:

$$\frac{\text{Total Project GHG Reductions (Metric Tons of CO}_2\text{e)}}{\text{Total GGRF Funds Requested ($)}}$$

GGRF Funds Requested is the total dollar amount requested through SWEEP from all agricultural operations associated with the proposed joint project. Section B describes the process for estimating the GHG emission reductions for the proposed SWEEP DWR joint project. Additional documentation and reporting requirements are provided in sections C and D.

Requirements for Program implementation and reporting are subject to change based on future revisions that apply to the Program (e.g., legislation or updates to ARB's Funding Guidelines). Implementing agencies/grantees should note that additional reporting may be required or modified for some types of projects based on the evolving needs of the Program. For example, the requirements and methods of data collection are still under development for Phase 2 reporting and will be published at a later date.

Program Assistance

CDFA staff, in conjunction with subject matter experts, will review the quantification portions of SWEEP DWR joint project applications to ensure that the methods described in this document were properly applied to estimate the GHG emission reductions for the proposed joint project. Applicants should use the following resources for additional questions and comments:

- Questions on this quantification document should be sent to GGRFProgram@arb.ca.gov.
- For more information on ARB's efforts to support implementation of GGRF investments, see: www.arb.ca.gov/auctionproceeds.
- Questions not related to this quantification document but pertaining to SWEEP should be sent to grants@cdfa.ca.gov.

Section B. Quantification Methodology

This methodology (1) estimates the GHG emission reductions of a proposed SWEEP DWR joint project based on reduction in on-farm energy use—as a result of eliminating groundwater pumping—and (2) accounts for the change in energy use from the enhancements made to the irrigation delivery system as part of the DWR Prop 1 funded project. DWR irrigation delivery system enhancements may include installation, replacement, or enhancement of new and existing system pumps, conversion to a less carbon intensive fuel, or installation of renewable energy generation. Water supplier applicants will use the ARB GHG calculator tool to estimate the total GHG emission reductions from the proposed project.

The following is a summary of the steps applicants will follow to estimate and report the GHG emission reductions for a proposed project. Detailed instructions for each step are provided on subsequent pages. An example of a proposed SWEEP DWR joint project quantification is included in Appendix A.

- Step 1 **Identify all agricultural operations:** The water supplier must identify all agricultural operations that are committed in the proposed project.

- Step 2 **Determine the inputs needed:** The water supplier applicant will use Table 1 to determine the required project details needed for input into the ARB GHG calculator tool for the agricultural operations identified in Step 1.

- Step 3 **Estimate GHG emission reductions (use ARB GHG calculator tool):** The applicant will enter the project details into the ARB GHG calculator tool to calculate the GHG emission reductions for the proposed project using the inputs identified in Step 2. A link to the ARB GHG calculator tool is available in Section A. Introduction, Tools.

Step 1: Identify All Agricultural Operations

The water supplier must identify all agricultural operations that are a part of the proposed project. This must include any agricultural operations within the water supplier service area that jointly filed applications for SWEEP funding. Each agricultural operation is required to eliminate on-farm pumping as a water supply source. The agricultural operations associated with the proposed project will be identified in the ARB GHG calculator tool under the Inputs-Agricultural Operations tab.

Step 2: Determine the Inputs Needed

Table 1 identifies the required data inputs for the ARB GHG calculator tool. Water suppliers must collect the necessary data from participating agricultural operations to complete the quantification.

Table 1. Required ARB GHG Calculator Tool Inputs

Agricultural Operations (Growers)
<p>Existing Conditions (prior to any project modification)</p> <ul style="list-style-type: none"> • GGRF funds requested (\$) as part of this solicitation; • Pump fuel amount or electricity use (gallons, therms, or kWh) <ul style="list-style-type: none"> ○ Must provide documentation from fuel receipts, electricity bills, etc. • Fuel type; • For each pump: <ul style="list-style-type: none"> ○ Make, model, and serial number ○ Horsepower (hP)
Water Supplier
<p>Existing Conditions (prior to any project modification)</p> <ul style="list-style-type: none"> • Annual water deliveries to the agricultural operations identified in Step 1 (gallons); • Pump fuel amount and electricity use associated with water delivery to the agricultural operations identified in Step 1 (gallons, therms, or kWh) <ul style="list-style-type: none"> ○ Must provide documentation from fuel receipts, electricity bills, etc. ○ The energy demand from the portion of the water delivery system can be prorated per gallon based on total water deliveries and system-wide energy use. • Fuel type for fuel used. <p>Proposed Project Details (both pre-project values and post-project estimates)</p> <ul style="list-style-type: none"> • Estimated annual water deliveries to the agricultural operations identified in Step 1 (gallons) • Anticipated pump fuel amount and electricity use for enhanced pressurized system (gallons, therms, or kWh) <ul style="list-style-type: none"> ○ This estimate must be substantiated with documentation from plant design. • Capacity of renewable energy installations (kW)

Step 3: Estimate GHG Emission Reductions Using the ARB GHG Calculator Tool

An overview of the ARB GHG calculator tool is provided below.

Summary Tab

- The Summary tab identifies total GHG emission reductions associated with SWEEP DWR joint project. In addition, the total GGRF funds requested and the total GHG emission reductions per total GGRF funds requested—the metric used for reporting—are summarized.

Read Me Tab

- On the Read Me Tab, enter the Project Name, Project ID from FFAST, and the contact information for person who can answer project specific questions from staff reviewers on the quantification calculations. This file must be submitted with other required application documents. Please use the following file naming convention: “[FAAST ID]_[Project Name]” not to exceed 20 characters.

Project Name:	Smith Brothers Irrigation District
Project ID - FFAST:	12-3456789
Contact Name:	John Smith
Contact Phone Number:	916-555-1234
Contact Email:	john@smithbros.com
Date Completed:	12/1/2015

Inputs – Water Supplier Tab

- Red headers** indicate a field that requires input by the project applicant. Water suppliers must complete all relevant data regarding the pressurized water delivery system enhancements. Definitions are provided in the Definitions tab. Inputs must be substantiated in the documentation provided in accordance with Section C. Documentation.

Inputs – Agricultural Operations Tab

- Red headers** indicate a field that requires input by the project applicant. Water suppliers must complete all relevant data on behalf of each agricultural operation joint applicant that will be integrated with the enhanced delivery system that is receiving SWEEP incentive funds as part of this solicitation from the GGRF. Water suppliers must complete a single input row for each affected on-farm pump for all agricultural operation joint applicants. Definitions are provided in the Definitions tab. Inputs must be substantiated in the documentation provided in accordance with Section C. Documentation.

GHG Emission Reduction Calculations

All equations and calculations are included in the ARB GHG calculator tool as part of this quantification methodology; detailed documentation is included in Appendix B. In general, GHG emissions reductions are calculated using the following approaches:

Table 2. GHG Emission Reduction Calculations

Agricultural Operations

GHG Emission Reductions = GHG Emissions of Existing Pumps

Water Supplier Delivery System

*GHG Emissions From Irrigation Delivery System
= GHG Emissions of Proposed Water Delivery System
– GHG Emissions of Existing Portion of Delivery System to be Enhanced*

Renewable Energy

GHG Emission Reductions = GHG Emissions of Displaced Fuel

Total Project

*Total Project GHG Emission Reductions =
GHG Emissions Reductions from All Agricultural Operators
+ GHG Emission Reductions from Renewable Energy
– GHG Emissions from Irrigation Delivery System*

Section C. Documentation

Applicants must report the estimated GHG emission reductions from the proposed project and provide documentation of the calculations and inputs used. Total Project GHG Emission Reductions are estimated in the ARB GHG calculator tool and found in the Summary Tab.

Applicants are required to provide electronic documentation that is complete and sufficient to allow the calculations to be reviewed and replicated. Paper copies of supporting materials must be available upon request by CDFA or ARB staff.

Documentation must include, at a minimum:

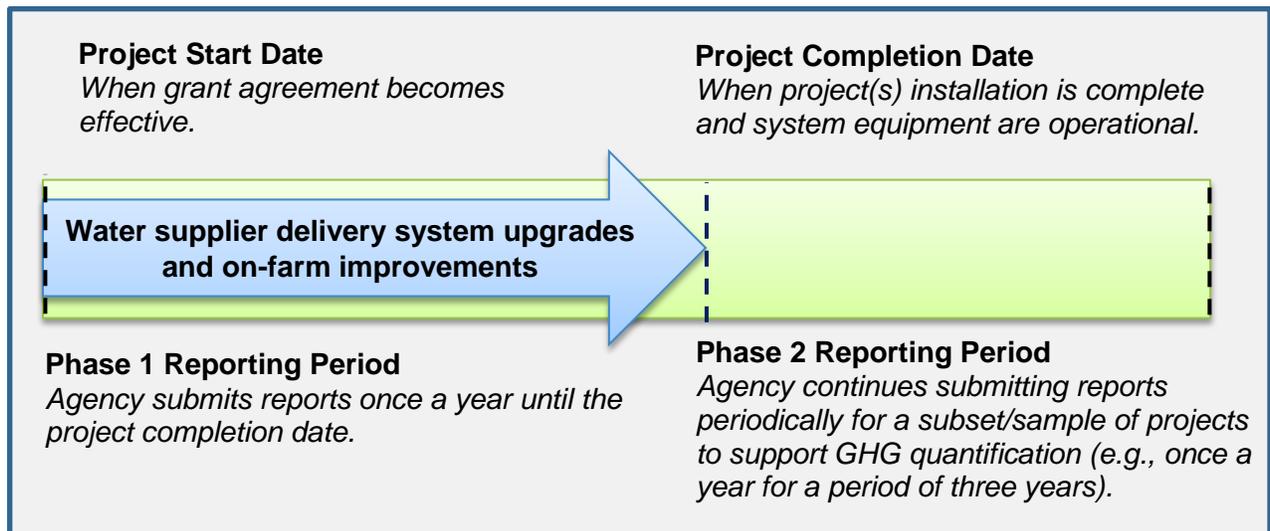
- Project application;
- Completed ARB GHG calculator tool file(s);
- Project description, including excerpts or specific references to the location in the main SWEEP application of the project information necessary to complete the applicable portions of the quantification methodology; and
- Project data support, including:
 - ARB GHG calculator tool inputs determined in Step 2;
 - Documentation of the project data used to support ARB GHG calculator tool inputs (i.e., energy use, pump and motor specifications, and proposed water delivery system design);
 - References to public documents that are the source of the project data.

Section D. Reporting after Funding Award

Accountability and transparency are essential elements for all GGRF California Climate Investment projects. Each administering agency is required to track and report on the benefits of the California Climate Investments funded under their program(s) and each funding recipient has the obligation to provide the necessary data or access to data for their project to support reporting on project outcomes.

In 2015, ARB developed Funding Guidelines for Agencies Administering California Climate Investments (Funding Guidelines).¹ These Funding Guidelines describe the reporting requirements and set the minimum project-level reporting requirements for projects funded by CDFA. Volume III of the Funding Guidelines summarizes the major reporting components that CDFA must report to ARB. Because much of this data will be aggregated by CDFA staff, SWEEP funding recipients will need to provide project data to CDFA to support these reporting requirements.

Table 3 and the figure below show the project phases and when reporting is required.



¹ California Air Resources Board. Funding Guidelines for Agencies Administering California Climate Investments. December 21, 2015. <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/arb-funding-guidelines-for-ca-climate-investments.pdf>.

Table 3. Quantification and Reporting By Project Phase

	Timeframe	Quantification Methodology Section
Project Selection	Covers the period from solicitation to selection of projects and funding awards.	All applicants use methods in this methodology to estimate GHG reductions based on application data.
Phase 1	Covers the period from the beginning of the project until it becomes operational or the initial implementation is completed.	Funded projects use methods in this methodology, as needed, to update GHG estimates based on project changes.
Phase 2	Starts after Phase 1 is complete and a project becomes operational.	GHG reductions achieved are quantified and reported for a subset of funded projects.

Phase 1 reporting is required for all SWEEP projects. CDFA will collect and submit data to ARB to satisfy Phase 1 reporting requirements. Recipients of SWEEP funding must report any changes that impact GHG emission reduction estimates (i.e., emergency on-farm pump use) to CDFA prior to project completion.

Phase 2 reporting is required for only a subset of SWEEP projects and is intended to document actual project benefits achieved after the project becomes operational. Phase 2 data collection and reporting will not be required for every project. CDFA will be responsible for identifying the subset of individual projects that must complete Phase 2 reporting, identifying who will be responsible for collecting Phase 2 data, and for reporting the required information to ARB. ARB will work with CDFA to address “Phase 2” procedures, including but not limited to:

- The **timelines** for Phase 2 reporting, i.e., when does Phase 2 reporting begin, how long will Phase 2 reporting be needed.
- As applicable, **approaches for determining the subset of projects** that need Phase 2 reporting (i.e., how many **X** projects out of **Y** total projects are required to have Phase 2 reporting).
- **Methods for monitoring or measuring** the necessary data to quantify and document achieved GHG reductions and other select project benefits.
- **Data to be collected**, including data field needed to support quantification of GHG emission benefits.
- Reporting requirements for transmitting the data to ARB or CDFA for program transparency and use in reports.

Once the Phase 2 quantification method and data needs are determined, ARB will develop and post the final ARB approved Phase 2 methodology for use in Phase 2 reporting.

Appendix A. Example Project

The following example is a hypothetical SWEEP DWR joint proposed project for the purpose of demonstrating how to use the ARB GHG calculator tool to estimate the GHG emission reductions resulting from the proposed project.

An irrigation district near Fresno is partnering with 10 local agricultural operations to build infrastructure for a pressurized delivery system. Each agricultural operation will be eliminating on-farm pumping and implementing on-farm measures to reduce water use as part of SWEEP. Each of the 10 agricultural operations currently pumps groundwater with diesel fuel.

The irrigation district sources irrigation water primarily from a surface reservoir. The current delivery system employs several older, inefficient vertical turbine pumps used in conjunction with a diesel motor. Through DWR's Prop 1 funding, the irrigation district proposes to convert the existing open-channel delivery system to a pressurized delivery system by replacing the inefficient diesel motor/pump system with a new and more efficient electric pumping system equipped with variable frequency drive (VFD) controllers. The proposed system was designed to meet the delivery needs of the 10 agricultural operations. The system design plans for the irrigation district estimate that the facility will use 200 MWh of electricity to meet the water demand.

In addition, the irrigation district proposes to install 50 kilowatt (kW) solar panels to provide renewable electricity to supplement a portion of the power to the electric pump system. Below are the steps that the applicant would perform to estimate the proposed project GHG emission reductions utilizing the ARB GHG calculator tool.

Step 1. Identify all agricultural operations that are included in the proposed project

The first step is for the water supplier to identify all agricultural operations that are included in the proposed project. The water supplier will consolidate applications from each of the 10 agricultural operations that are associated with the project. Once the water supplier has connected with each of the applicants, the water supplier can compile the relevant data needed to estimate net project GHG emission reductions.

Steps 2 & 3. Determine the Inputs Needed and Estimate GHG Emission Reductions (using ARB GHG Calculator Tool)

The applicant determines all of the required inputs from Table 1 for the ARB GHG calculator tool to estimate GHG emission reductions. The water supplier must include information about the water delivery system as well as aggregate data from agricultural operations. The next step for the water supplier applicant is to review the Read Me tab of the ARB GHG calculator tool and to enter the project identifier information.

Below is an example of the required project identifier information that is entered by an applicant.

Project Name:	Smith Brothers Irrigation District
Project ID :	12-3456789
Contact Name:	John Smith
Contact Phone Number:	916-555-1234
Contact Email:	john@smithbros.com
Date Completed:	8/1/2016

Next, the water supplier applicant enters proposed irrigation system enhancement information for both pre-project and post-project scenarios into the ARB GHG calculator tool located in the Inputs – Water Supplier tab. The **red headers** under the “Input Data” column are project descriptors and indicate the fields (highlighted in yellow) that the applicant enters into the applicable pre-project and post-project columns. Below are sample inputs for the ARB GHG calculator tool from the example proposed project.

Existing Portion of Delivery System to be Enhanced

The “Existing Portion of Delivery System to be Enhanced” section is required for every applicant. Each project descriptor must have the associated project input.

Existing Portion of Delivery System to be Enhanced	
Input Data	Pre-Project
Water deliveries in previous year (gallons)	3,000,000
Total existing system pump fuel use (gallons, scf)	1,000
Fuel type from existing system fuel use	Diesel
Fuel Emissions Factor	0.013818137
Total existing system pump electricity use (kWh)	
Pre-project system emissions	13.82

Proposed Enhanced System

The “Proposed Enhanced System” section is required for every applicant. Each project descriptor must have the associated project input. If proposed project includes a renewable energy component, please include the capacity of installation and the nearest reference city. The reference city will populate the appropriate capacity factor. Total electrical energy demand entered for the proposed system must include the power sourced from renewable installations.

Proposed Enhanced System	
Input Data	Post-Project
Estimated post project annual water delivery (gallon)	3,000,000
Total proposed system pump fuel use (gallons, scf)	
Fuel type from proposed system fuel use	
Fuel Emissions Factor	#N/A
Total proposed system pump electricity use (kWh)	200,000
Post-project system emissions	75.72
Renewable Energy	
Input Data	Post-Project
Renewable energy capacity (kW)	50
Nearest Reference City	Fresno
Renewable energy emission reductions	29.04
GHG Emission Increase	32.86

Emission Reductions (MTCO₂e) per Total GGRF Funds represent the total benefits for the proposed project per dollar requested. For this example this value would be 0.00006 MTCO₂e per GGRF \$.

Results	GHG Emissions (MTCO ₂ e)	Description
GHG Benefits per Growing Season	12.39	Annual GHG Emission Reductions (MTCO ₂ e/yr)
Total Project GHG Emission Reductions	37.17	Total GHG Emission Reductions (MTCO ₂ e)
Total GGRF Funds Requested (\$)	575,000.00	Total SWEEP funds requested
Total GHG Emission Reductions per Total GGRF Funds Requested (\$)	0.00006	Total Reductions per SWEEP funds requested

Appendix B. GHG Emission Reduction Calculations

Pre-Project Water Delivery System Emissions

GHG Emissions from Existing Portion of System with Non-Electric Pumps

$$GHG_{pre-project\ fuel} = Fuel\ Use \times EF_{fuel\ pre-project} \quad (\text{Eq. 1.a})$$

GHG Emissions from Existing Portion of System with Electric Pumps

$$GHG_{pre-project\ electricity} = Electricity\ Use \times EF_{electricity} \quad (\text{Eq. 1.b})$$

GHG Emissions from Existing Portion of System

$$GHG_{pre-project} = GHG_{pre-project\ fuel} + GHG_{pre-project\ electricity} \quad (\text{Eq. 1.c})$$

Where:

- $GHG_{pre-project\ fuel}$ = GHG emissions from fuel use in existing water delivery system that provides water to the agricultural operations identified in Step 1 (MTCO_{2e})
- Fuel Use = pre-project documented fuel use (gallons or scf) (i.e., fuel receipts)
- $EF_{fuel\ pre-project}$ = Emission factor of pre-project fuel (MTCO_{2e} per gallon of scf)
- $GHG_{pre-project\ electricity}$ = GHG emissions from electricity use in existing water delivery system that provides water to the agricultural operations identified in Step 1 (MTCO_{2e})
- Electricity Use = pre-project documented electricity use (kWh) (i.e., utility bills)
- $EF_{electricity}$ = emission factor from electricity (0.000378576 MTCO_{2e}/kWh)²
- $GHG_{pre-project}$ = GHG emissions from existing water delivery system (MTCO_{2e})

Post-Project Water Delivery System Emissions

GHG Emissions from Enhanced System with Non-Electric Pumps

$$GHG_{post-project\ fuel} = Fuel\ Use \times EF_{fuel\ post-project} \quad (\text{Eq. 2.a})$$

GHG Emissions from Enhanced System with Electric Pumps

$$GHG_{post-project\ electricity} = Electricity\ Use \times EF_{electricity} \quad (\text{Eq. 2.b})$$

GHG Emissions from Enhanced System

$$GHG_{post-project} = GHG_{post-project\ fuel} + GHG_{post-project\ electricity} \quad (\text{Eq. 2.c})$$

² The emission factor for electricity is derived from ARB's Low Carbon Fuels Standard regulation. http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/040115_pathway_ci_comparison.pdf

Where:

- $GHG_{\text{post-project fuel}}$ = GHG emissions from fuel use in proposed enhanced water delivery system (MTCO₂e)
- Fuel Use = estimated post-project fuel use (gallons or scf) with supportable documentation from project design plans
- $EF_{\text{fuel post-project}}$ = Emission factor of post-project fuel (MTCO₂e per gallon of scf)
- $GHG_{\text{post-project electricity}}$ = GHG emission from electricity use in proposed enhanced water delivery system (MTCO₂e)
- Electricity Use = estimated post-project electricity use (kWh) with supportable documentation from project design plans
- $EF_{\text{electricity}}$ = emission factor from electricity (0.000378576 MTCO₂e/kWh)
- $GHG_{\text{post-project}}$ = GHG emissions from proposed enhanced water delivery system (MTCO₂e)

GHG Emissions Reductions from Installation of Renewable Energy

GHG Emission Reductions from Renewable Energy

$$GHG_{\text{Renew}} = \text{Capacity} \times \text{Capacity Factor}_{\text{solar}} \times 8,766 \times EF_{\text{electricity}} \quad (\text{Eq. 3})$$

Where:

- Capacity = Capacity of renewable energy installation (kW)
- Capacity Factor = Regional average of renewable performance³
- 8,766 = Hours per year of renewable energy generation potential (hr)
- GHG_{Renew} = GHG emissions reductions from on-farm renewable energy (MTCO₂e)

GHG Emissions Reductions from Agricultural Operations

GHG Emission Reductions from Agricultural Operations with Fuel Use

$$GHG_{\text{on-farm fuel}} = \text{Fuel Use} \times EF_{\text{fuel on-farm}} \quad (\text{Eq. 4.a})$$

GHG Emission Reductions from Agricultural Operations with Electricity Use

$$GHG_{\text{on-farm electricity}} = \text{Electricity Use} \times EF_{\text{electricity}} \quad (\text{Eq. 4.b})$$

GHG Emission Reductions from Agricultural Operations

$$GHG_{\text{on-farm}} = GHG_{\text{on-farm fuel}} + GHG_{\text{on-farm electricity}} \quad (\text{Eq. 4.c})$$

³ CEC (2013). Cost-Effectiveness of Rooftop Photovoltaic Systems for Consideration in California's Building Energy Efficiency Standards. Available online at: <http://www.energy.ca.gov/2013publications/CEC-400-2013-005/CEC-400-2013-005-D.pdf>

Where:

- $GHG_{on-farm\ fuel}$ = GHG emission from fuel use in existing on-farm pump (MTCO₂e)
- Fuel Use = on-farm documented fuel use (gallons or scf) (i.e., fuel receipts)
- $EF_{fuel\ on-farm}$ = Emission factor of fuel currently used on-farm (MTCO₂e per gallon of scf)
- $GHG_{on-farm\ electricity}$ = GHG emission from electricity use in existing on-farm pump(MTCO₂e)
- Electricity Use = on-farm documented electricity use from pumping (kWh) (i.e., utility bills)
- $EF_{electricity}$ = emission factor from electricity (0.000378576 MTCO₂e/kWh)
- $GHG_{on-farm}$ = GHG emission reductions from elimination of on-farm pumping (MTCO₂e)

GHG Emissions Reductions from SWEEP DWR Joint Project Implementation

GHG Emission Reductions from SWEEP DWR Joint Project

$$GHG_{total} = GHG_{on-farm} + GHG_{renew} - (GHG_{post-project} - GHG_{pre-project}) \quad \text{(Eq. 5)}$$

Where:

- GHG_{total} = GHG emissions reductions from the SWEEP DWR joint project implementation (MTCO₂e)