

2017 State Water Efficiency and Enhancement Program

State Water Efficiency and Enhancement Program is funded by the California Climate Investments Program



Request for Grant Applications

Released:
January 31, 2017

Grant Applications Due:
By 5:00 p.m. PST on March 14, 2017
No late submissions accepted.



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Background and Purpose

The California Department of Food and Agriculture (CDFA) is pleased to announce, in coordination with the State Water Resources Control Board (SWRCB) and the Department of Water Resources (DWR), a competitive grant application process for the 2017 State Water Efficiency and Enhancement Program (SWEEP).

The 2017 SWEEP funding arises from the Budget Act of 2016, AB 1613, which authorizes CDFA to support greenhouse gas (GHG) emission reductions through water and energy efficiency grants promoting water and energy savings. SWEEP is part of California Climate Investments funded through the Greenhouse Gas Reduction Fund.

The program's objective is to provide financial incentives for California agricultural operations to invest in irrigation systems that reduce GHG emissions and save water.

Funding and Duration

The 2017 SWEEP will disperse up to \$4.5 million to California agricultural operations investing in irrigation systems that reduce GHG emissions and save water. The maximum grant award is \$100,000 with a recommended 50 percent match of the total project cost. The maximum grant duration is 12 months. Therefore, cost incurred before June 1, 2017 will not be reimbursed and project installation must be completed no later than May 31, 2018. CDFA reserves the right to offer an award different than the amount requested.

Eligibility and Exclusions

The irrigation project must be on a California agricultural operation.

- For the purpose of this program, an agricultural operation is defined as row, vineyard, field and tree crops, commercial nurseries, nursery stock production, and greenhouse operations.
- Academic institutions and governmental organizations are *not* eligible for funding.

Projects *must* reduce GHG emissions *and* save water. Applicants must provide supporting documentation directly related to actual, on-farm water consumption and GHG emissions during the prior growing season to be eligible for funding.

SWEEP funding cannot be combined with United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) Environmental Quality Incentive Program financial assistance, meaning that applicants may not accept funding from both entities for the same project.

SWEEP grant funds cannot be used to:

- Expand existing agricultural operations (i.e., additional new acreage cannot be converted to farmland)
- Install new groundwater wells or increase well depth
- Test new technology or perform research

(See [page 8](#) for information on allowable and unallowable costs.)

Analysis of Potential Adverse Impacts

Senate Bill 859 (Budget and Fiscal Review Committee, Chapter 368, Statutes of 2016) requires applicants to conduct an analysis identifying potential adverse impacts of the proposed project. CDFA is required to review the applicant's analysis prior to awarding grant funds.

The analysis must address net increase in criteria pollutants, toxic air contaminants, and hazardous air pollutants; groundwater and surface water impacts; and truck traffic and odor.

Due to the nature of the project types funded through this program, CDFA can reasonably expect no localized impacts. Per the eligibility requirements of this program, projects must result in a net GHG emission reduction. These emission reductions are a result of a reduction of fuel use from pumping activities. Fuel use reductions will result in direct reductions of associated air emissions (including criteria, toxics, and hazardous air pollutants). Eligible projects must also reduce water use, thereby benefiting groundwater and surface water supplies. No impact in truck traffic or odor can be expected from these project types.

Timeline

The application period begins Tuesday, January 31, 2017. The deadline to submit a grant application is Tuesday, March 14, 2017 at 5 p.m. (PST). ***No exceptions will be granted for late submissions.***

CDFA will conduct three workshops and one webinar on the 2017 SWEEP grant solicitation process and program requirements. For CDFA grant application workshop schedule and locations, visit the SWEEP website at www.cdfa.ca.gov/go/SWEEP. (See Technical Assistance section for details regarding technical assistance workshops available for assistance with development and/or submission of a grant application.)

Invitation to Submit Grant Applications	January 31, 2017
CDFA Grant Application Workshops and Webinar	February 7 – 10, 2017
Grant Applications Due	March 14, 2017 5:00 p.m. PST
Announce and Award Funding	May 2017

Project Types

CDFA has identified the following project types that address GHG emission reductions ***and*** water conservation. The project types are intended to guide prospective applicants to develop projects that achieve GHG emission reductions ***and*** water savings. Applicants should consider incorporating several projects types listed below to achieve both GHG emission reductions ***and*** water savings.

Water Savings

Weather, Soil, or Plant Based Sensors for Irrigation Scheduling

Examples include soil moisture or plant sensors (NRCS Conservation Practice Standard 449) with electronic data output or electronic weather station linked to irrigation controller for growers to ensure efficient irrigation scheduling. Use of evapotranspiration (ET) based irrigation scheduling, such as the California Irrigation Management Information System (CIMIS) on existing or proposed projects to optimize water efficiency for crops. Telemetry components that allow the electronic communication between technology devices are eligible for funding through SWEEP.

Micro-Irrigation or Drip Systems

Use of micro-irrigation or drip systems, including sub-surface drip systems. Should follow NRCS Conservation Practice Standard 441.

Greenhouse Gas Emission Reductions

Fuel Conversion

The conversion of a fossil fuel pumps to solar, wind, electric, or natural gas resulting in a reduction of GHG emissions. Renewable energy, including solar, installations that power irrigation systems are eligible for SWEEP funding.

Improved Energy Efficiency of Pumps

Examples include retrofitting or replacing pumps. NRCS Conservation Practice Standard 372 or 533 may apply.

Low Pressure Systems

Use of low pressure irrigation systems to reduce pumping and energy use. For example, the conversion of a high pressure sprinkler system to a low pressure micro-irrigation system or lower pressure sprinkler system. Should follow NRCS Conservation Practice Standards 441 or 442.

Variable Frequency Drives

Use of Variable Frequency Drives to reduce energy use and match pump flow to load requirements. Should follow NRCS Conservation Practice Standard 533.

Reduced Pumping

For example, improved irrigation scheduling may lead to reduced pump operation times.

Other Management Practices

CDFA supports innovative projects and understands there is variability in irrigation systems throughout California. For this reason, applicants may propose projects that do not fit into the above project types as long as water savings can be calculated *and* GHG reductions can be quantified using the [Air Resources Board \(ARB\)-approved Quantification Methodology](#) (Appendix D).

Program Requirements

An agricultural operation can only submit one grant application using a unique tax identification number. If an agricultural operation does not have a unique tax identification number, that operation should only

use the *last four digits* of their social security number (e.g., 000-00-1234) as their unique business identification number in their grant application.

An agricultural operation must use the operation's legal business name and associated tax identification number in their application. The business name provided in the application is the entity to which CDFA will extend a Grant Agreement if the project is selected for an award. ([See page 12](#) for details regarding the Award Process.)

Applications *cannot* build upon *any* previously funded SWEEP projects directly affecting the same Assessor's Parcel Numbers (APN). However, applicants are encouraged to apply for a new project with different APNs.

Applicants must include flow meters in their proposed project or demonstrate actual water use will be *measured* with existing flow meters. ([See page 6](#) for more specifics on project design requirements.)

The California Air Resources Board (ARB) has developed a GHG calculation methodology for use in estimating proposed projects GHG reductions. This methodology includes a GHG Calculator Tool intended to assist applicants in determining GHG reductions from estimated on-farm energy savings as a result of project implementation.

Applicants are required to use and submit the ARB GHG Calculator Tool referred to in Section B of the California Air Resources Quantification Methodology for SWEEP, which is available at: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/cdfa_sweep_finalqm_16-17.pdf. In order to complete the required calculator, applicants will need to attach a pump efficiency test for existing irrigation pumps impacted by the proposed project.

If selected for an award, execution of the Grant Agreement is conditional upon applicants agreeing to the following program requirements:

- Pre-Project consultation conducted by a CDFA Environmental Scientist to confirm project site information and discuss implementation plans
- Post-project verification conducted by a CDFA Environmental Scientist, or in partnership with a local Resource Conservation District (RCD), to evaluate the project site and quantify GHG reductions and water savings
- To meet the requirements of California Climate Investments, all project-related water and energy use records must be made available to CDFA or its third party designees for three years following project implementation.
- Expectation to use and maintain system for a minimum of 10 years

([See page 12](#) for more details regarding project implementation requirements.)

Technical Assistance

CDFA strongly encourages applicants to obtain technical assistance from a professional irrigation specialist when developing a grant application. These specialists are key resources in calculating the potential GHG reductions and water savings of the project design. Therefore, the technical assistance from a specialist will improve the accuracy of GHG reductions and water savings calculations resulting in a more competitive grant application.

In addition to CDFA's informational grant application workshops, technical assistance workshops will be hosted by California academic research institutions, RCDs, or non-profit organizations that are awarded a 2017 SWEEP Technical Assistance Workshop grant. The Technical Assistance Workshops are an opportunity for SWEEP applicants to obtain assistance with the development and/or submission of their SWEEP grant application. Applicants will have access to a computer and internet, and an irrigation specialist will also be available to provide guidance on completing the required GHG reductions and water savings calculations and answer any technical questions. Access CDFA's SWEEP website www.cdfa.ca.gov/go/sweep for more details regarding these technical assistance workshops.

Grant Application Process

How to Apply

CDFA continued its partnership with the State Water Resources Control Board (SWRCB) to host a web-based application submission process. Applicants will utilize the SWRCB's Financial Assistance Application Submittal Tool (FAAST). FAAST can be accessed through the SWRCB website at <http://faast.waterboards.ca.gov/>. Applicants must create a user account in FAAST to submit a grant application.

FAAST is organized into several tabs and includes a question and answer format. The Questionnaire tab in FAAST contains the grant application, which is a series of questions regarding the proposed project. Questions are answered in one or more of the four following formats: a drop down menu; a check box; a text box with predetermined character limitations; or as a document attachment. Responses to all questions must be submitted in the manner and format required by the application questionnaire in FAAST without exception.

The SWRCB website contains a Frequently Asked Questions section and a User Manual for the FAAST system. After reading the information available on the website, applicants that have additional questions about the FAAST System should contact FAAST customer service at (866) 434-1083, Monday through Friday, 8:00 am to 5:00 pm or via email, faast_admin@waterboards.ca.gov.

Prior to completing the application questionnaire in FAAST, applicants are encouraged to gather all required information using Appendix A: Grant Application Checklist and Appendix B: FAAST Grant Application Questions to facilitate effective and timely submission of the grant application. Applicants are required to submit the following attachments:

- Project design;
- [Budget Worksheet](#);
- Completed [SWEEP Irrigation Water Savings Assessment Tool](#);
- Completed [ARB GHG Calculator Tool](#) provided in the ARB Quantification Methodology for SWEEP, including the following supporting documents related to inputs provided in the ARB GHG Calculator Tool;
 - Baseline GHG emission documentation (e.g., fuel receipts or utility bills);
 - Pump efficiency tests and pump specification documents. (*Required by the [ARB Quantification Methodology](#)*)

Project Design

Applicants are required to submit a project design for the proposed irrigation system. The design must include a detailed schematic and locations of where equipment and infrastructure will be installed in the field. All project design costs will be at the expense of the agriculture operation.

Project designs must also include the following, as applicable:

- For new infrastructure, such as new irrigation piping, pumps, or sensors, include a detailed schematic and locations of the where that infrastructure will be installed on the field
- For improvements to existing infrastructure, include a schematic illustrating where the improvements will be made to the existing infrastructure
- Identify pertinent agronomic information, such as the crop and water distribution uniformity value of the irrigation system
- For use of ET based irrigation scheduling, show water deliveries can be made on a consistent basis to accommodate that scheduling
- Projects that include the installation of renewable energy, such as photovoltaic panels, must include the location, engineering and energy output specifications of the proposed installation

Water and Energy Use Documentation

Applicants are required to submit water and energy use supporting documentation to substantiate water savings and GHG reductions calculations provided in their application.

Grant applications that do not attach the required types of water and energy use documentation cannot be funded.

Specific requirements pertaining to water and GHG documentation are specified below:

Water Use Documentation

SWEEP Irrigation Water Savings Assessment Tool (Microsoft Excel Workbook)

The SWEEP Irrigation Water Savings Assessment Tool allows applicants to select specific on-farm variables directly related to current irrigation systems and the proposed irrigation systems and change in practices. Therefore, it is sufficient documentation to demonstrate baseline water use and projected water savings estimates.

Applicants must complete and attach the SWEEP Irrigation Water Savings Assessment Tool. Applicants must complete the “before” tab of the calculator to estimate baseline water use on the field with the current crop and irrigation practice. The applicant must also complete the “after” tab to estimate the projected water savings after project installation. The estimated water savings will be shown on the “Estimated Water Savings” tab of the calculator. Note that the estimated water savings from the SWEEP Water Savings Assessment Tool is a required input to the ARB GHG Calculator Tool.

Greenhouse Gas Emission Documentation

To determine the impact of the proposed project on GHG emissions, applicants **must** follow the ARB-approved GHG Quantification Methodology (Appendix D). This methodology utilizes a GHG Calculator Tool developed by ARB to estimate GHG emission reductions from changes in fuel use.

The Quantification Methodology can also be found at:
https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/cdfa_sweep_finalqm_16-17.pdf.

ARB GHG Calculator Tool (Microsoft Excel workbook)

Applicants are required to complete and attach the [ARB GHG Calculator Tool](#). Applicants must use energy records from 2016 and other on-farm specifications (e.g., pump tests) to complete the calculator.

Supporting Documentation for GHG Calculations

Supporting documentation submitted along with the calculator must be sufficient to allow for CDFA or ARB reviewers to replicate the calculations. Applicants must provide an explanation of inputs used in the calculator in their application.

Applicants are required to attach the following supporting documentation:

- Utility bills, actual fuel receipts, and/or field operational logs covering at least six months of the prior peak irrigation and growing season (2016). (In situations where the project involves crop rotation, up to three years of supporting documents may be provided to substantiate a representative baseline of energy use from pumping.)
 - Documents must capture actual, not estimated, energy use data (e.g., gallons, kWh, etc.)
 - Documents must indicate a specific time period (e.g., months/dates) for the on-farm energy use. (For months with no on-farm energy use, indicate no usage for those months during the growing season.)
 - Field operational logs are defined as on-farm data compiled during a growing season and maintained as a common business practice by the agricultural operation to capture an actual time period (e.g., months and dates) of on-farm energy use values (e.g., gallons, kWh, etc.). Documents that provide estimates are *not* considered field operational logs.
- Pump and motor specifications for proposed pumps
- Pump tests for existing pump(s)
- Completed SWEEP Irrigation Water Savings Assessment Tool

Applicants will be required to describe how the baseline GHG calculation value is supported by the on-farm energy documentation attached to their application. A response must be provided in the grant application explaining how the GHG documentation directly relates to the irrigation system.

Budget Worksheet (Microsoft Excel workbook)

Download the Budget Worksheet template from FFAST or from the [CDFA SWEEP website](#). Applicants are required to download and complete a Budget Worksheet by entering the amount of grant funds budgeted for each category and itemizing all costs included in the grant request for the proposed project. The Budget Worksheet must be attached in Microsoft Excel format and be consistent with the project design. (See [Appendix C](#) for the Budget Worksheet.) Failure to submit the required Budget Worksheet or submission of an alternate template/file type may result in disqualification.

Applicants should use the USDA, NRCS payment schedules as a guide, to the extent feasible, to determine project costs. (See [Appendix E](#) for the USDA, NRCS Payment Schedules.)

Budget Cost Categories:

A. Supplies

Itemize the estimated cost of supplies by providing a description and quantity to be purchased. Supplies are items with an acquisition cost less than \$5,000 per unit that are used exclusively for the project (e.g., pipes, tubing).

B. Equipment

Itemize the estimated cost for any equipment by providing a description and quantity to be purchased. Equipment is an article of nonexpendable, tangible personal property, which equals or exceeds \$5,000 per unit (e.g., solar panels, irrigation pumps).

C. Labor

Labor costs cannot exceed 25% of the total SWEEP grant request. Labor costs in excess of 25% of the total SWEEP grant request must be covered by matching funds. Estimate the cost for any work on the project that will be performed by individuals associated with a contractor. Provide a brief description of services and the cost/hour necessary for installation (e.g., labor for electrician, concrete work).

D. Other

Itemize the estimated cost of any other allowable expenses not covered in the previous budget categories necessary for project implementation (e.g. permits, monthly or annual service charges).

Allowable Costs

Project costs must be itemized and clearly support installation of irrigation systems, including supplies, equipment, labor, and any other allowable cost necessary for project implementation. Project cost must be reasonable and consistent with cost paid for equivalent work on non-grant funded activities or for comparable work in the labor market.

Examples of allowable costs include:

- Installation of photovoltaic panels to power irrigation systems
- All components of micro-irrigation irrigation systems
- Sensor hardware and telemetry
- Software associated with sensors and weather stations
- Flow meters

Unallowable Costs

Unallowable costs, include, but are not limited to:

- Project design costs (e.g., engineering)
- Costs associated with technical assistance
- Post-project service charges and maintenance costs associated with the irrigation system
- Non-labor costs (e.g., management) and fees associated with project oversight
- Labor costs in excess of 25% of the total SWEEP grant request
- Supplies and equipment costs not related to irrigation or water distribution systems
- Costs associated with drilling of new or expanding groundwater wells
- Irrigation training courses
- Soil management practices
- Pump efficiency test

Review and Evaluation Process

CDFA will conduct multiple levels of review during the grant application process:

1. The first level of review is an administrative review to determine whether application requirements were met and, if applicable, assess an applicant's past SWEEP grant performance.
2. The second level review is a technical review by a group of agricultural irrigation water system specialists and experts affiliated with the University of California and California State University systems. The technical reviewers will evaluate grant applications based on the overall expected success of the project, including the potential for the project to reduce GHG emissions and save water.
3. CDFA will select applications for funding based upon the score provided by the reviewer, the level of GHG reductions and water savings, and several other additional considerations. CDFA's intent is to fund projects that will result in the highest degree of GHG emission reduction and water savings.

Additional Considerations

During the review process, the following additional considerations will be evaluated when selecting projects for an award of funds based on the number of additional criteria met:

- Completion of or a commitment to complete Irrigation Training
- Location within a Critically Over-drafted Groundwater Basin
- Soil Management Practices
- Matching Funds
- New SWEEP Recipients

Irrigation Training

Irrigation training is a critical component to irrigation management and agricultural water conservation. CDFA strongly encourages applicants to participate in an irrigation training course to maximize the benefits of a well-designed and maintained irrigation system. During the review process, grant applications will receive additional consideration if the applicant has attended an irrigation training relevant to the SWEEP project within the last two years or commits to attend an irrigation training course during the course of the project term.

Applicants may consider training resources provided on the program website at www.cdfa.ca.gov/go/SWEEP. However, applicants may also select an alternative training course that best meets the needs of their operation. Training courses should be focused on efficient and effective irrigation types, water management strategies, and tools. To receive extra consideration for training, applicants must identify the irrigation training course in their grant application.

If awarded, the irrigation training course will become part of the Grant Agreement between the agricultural operation and CDFA. Therefore, project completion will be conditional upon completing the required training course during the grant term. Recipients must provide evidence (i.e., certificate of completion) confirming attendance. CDFA encourages agriculture operations to consider having both the agriculture operation's manager and irrigator attend a training course; however, only one agriculture operation representative is required to attend.

Applicants that previously completed irrigation training must attach evidence (e.g., certificate of completion) to the grant application confirming attendance to receive the extra consideration during the review process.

Critically Over-drafted Groundwater Basins

Projects that demonstrate reduced groundwater pumping within critically over-drafted groundwater basins will receive extra consideration during the review process. Applicants must use the online map provided below to determine if their project falls within a critically over-drafted groundwater basin as identified by the DWR. A list of the basins, including the basin numbers, is identified in Table 1. If a proposed project reduces groundwater pumping within a critically over-drafted ground water basin, applicants must identify the number of the basin within the application.

[State-wide map of critically over-drafted groundwater basins](#)

Table 1

List of Critically Over-drafted Groundwater Basins (January 2016)	
Basin Number	Basin/Sub-basin Name
3-01	Soquel Valley
3-02	Pajaro Valley
3-04.01	180/400 Foot Aquifer
3-04.06	Paso Robles
3-08	Los Osos Valley
3-13	Cuyama Valley
4-04.02	Oxnard
4-06	Pleasant Valley
5-22.01	Eastern San Joaquin
5-22.04	Merced
5-22.05	Chowchilla
5-22.06	Madera
5-22.07	Delta-Mendota
5-22.08	Kings
5-22.09	Westside
5-22.11	Kaweah
5-22.12	Tulare Lake
5-22.13	Tule
5-22.14	Kern County
6-54	Indian Wells Valley
7-24	Borrego Valley

Soil Management Practices that increase Water-Holding Capacity

Increasing soil organic matter has multiple benefits including increased water-holding capacity of the soil and carbon sequestration. These benefits are in line with the purpose of SWEEP; therefore, projects that integrate one or more of the following soil management practices identified below will receive additional consideration providing the management practice(s) will not result in an increase in on-farm water demand or energy use.

- Cover cropping ([USDA NRCS Conservation Practice Standard 340](#))
- Mulching ([USDA NRCS Conservation Practice Standard 484](#))
- Compost application
- [Resource conserving crop rotation](#)

Any of the management practices that are indicated in the project application will become part of the grant agreement terms and incorporated into the scope of work. Awardees should follow applicable USDA NRCS Conservation Practice Standards when implementing these management practices.

Matching Funds

Matching funds are not required, but applicants are strongly encouraged to include a 50 percent match. Applications that include matching funds will receive additional consideration

Matching funds are defined as a portion of project costs not borne by the SWEEP grant award and can include cash and/or in-kind contributions. In-kind contributions include costs associated with labor involved with the installation of the project. Applicants choosing to use matching funds are encouraged to submit written documentation describing the source of matching funds with the grant application.

Assistance and Questions

CDFA cannot assist in the preparation of grant applications; however, general questions may be submitted to grants@cdfa.ca.gov. In order to ensure all potential applicants benefit from receiving all submitted questions and answers, CDFA will post Frequently Asked Questions (FAQ) on January 31, 2017 on the SWEEP website and an additional FAQ will be posted according to the following schedule:

Questions Received by:	Responses Posted by:
February 10, 2017 at 8:00 am PST February 24, 2017 at 8:00 am PST	February 15, 2017 at 5:00 pm PST March 1, 2017 at 5:00 pm PST

In order to maintain the integrity of the competitive grant process, CDFA is unable to advise and/or provide applicants with any information regarding specific grant applications during the solicitation process.

Notification and Feedback

All applicants will be notified regarding the status of their grant application. Applicants not selected for funding will receive feedback on their grant application within 60 days after receiving notification.

Disqualifications

The following will result in the disqualification of a grant application:

- Incomplete grant applications: applications with one or more unanswered questions necessary to administrative or technical review.

- Incomplete grant applications: applications with missing, blank, unreadable, corrupt, or otherwise unusable attachments.
- Applications for more than the maximum award amount.
- Applications with unallowable costs or activities necessary to complete the project objectives.

APPEAL RIGHTS: Any discretionary action taken by the Office of Grants Administration (OGA) may be appealed to CDFA's Office of Hearings and Appeals Office within ten (10) days of receiving a notice of disqualification from CDFA. The appeal must be in writing and signed by the responsible party named on the grant application or his/her authorized agent. It must state the grounds for the appeal and include any supporting documents and a copy of the OGA decision being challenged. The submissions must be sent to the California Department of Food and Agriculture Office of Hearings and Appeals, 1220 N Street, 4th Floor, Sacramento 95814 or emailed to CDFA.LegalOffice@cdfa.ca.gov. If submissions are not received within the time frame provided above, the appeal will be denied.

Award Process

Grant Agreement

CDFA will initiate the Grant Agreement process with applicants selected to receive a 2017 SWEEP grant award. Applicants with projects selected for award of funds will receive a Grant Agreement package with specific instructions regarding award requirements including information on project implementation, verification, and payment process. In addition, a CDFA Environmental Scientist will contact each Recipient to schedule a project consultation to confirm project site information and discuss implementation plans.

Project Implementation

Once a Grant Agreement is executed, the grant recipient can begin implementation of the project.

Recipients are responsible for the overall management of their awarded project to ensure all project activities, including labor associated with installation, are completed no later than May 31, 2018. For projects involving utility interconnection, recipients must take the necessary steps to begin the interconnection process after execution of the Grant Agreement to ensure utility interconnection work is complete by this date.

Project implementation must occur on the APNs identified in the Grant Agreement scope of work. Failure to install a project on the APNs identified in the scope of work may result in all or any portion of the grant funding withheld or termination of the Grant Agreement.

CDFA may conduct a Critical Project Review upon reasonable notice at any time during the project term. The purpose is to determine whether deliverables are being met and evaluate project progress to ensure installation is complete within the grant term. Recipients may be required to submit financial records and project documentation to ensure SWEEP funds are used in compliance with the Grant Agreement terms and conditions.

Payment Process

CDFA will provide the grant recipient with the necessary grant award and invoicing documents. Grant recipients may be eligible to receive an advance payment up to 25 percent of the total grant award for project installation. The remaining funds will be allocated on a reimbursement basis through quarterly or monthly invoicing.

CDFA will withhold 10 percent from the total grant award until the verification requirement is complete to ensure grant recipients install their project as approved by CDFA.

Project Verification

Following project implementation, a CDFA Environmental Scientist, or a local RCD in partnership with CDFA, will initiate the verification component. The verifier will visit the project site, and inspect the completed project to ensure design specifications were met and the system is working effectively. In addition, the verifier will take photographs to document project completion. The verification component must be completed by June 30, 2018.

Post-Project Completion Requirements

Execution of the Grant Agreement is conditional upon agreement to post-project completion requirements. Recipients are expected to maintain documentation related to the SWEEP funded project, including energy and water use documentation, to report actual benefits achieved for a period of three years after project completion. The purpose of this reporting is to demonstrate the long-term success of SWEEP awarded projects by documenting GHG emission reductions and water savings data.

After the project is operational, a CDFA Environmental Scientist will work with recipients to collect the necessary data and quantify GHG emission reductions and water savings. This may entail enrollment with a third party contactor to monitor energy use from the project site.

Failure to work with CDFA or its designees to provide the necessary project-related documentation will be considered non-performance. In the event of non-performance, CDFA may take any action deemed necessary to recover all or any portion of the grant funding.

Appendix A: Grant Application Checklist

Application Components

- Completed FAAST Application**
 - Overview: **General Information**
 - Section I: **Previously Funded Project**
 - Section II: **Property Information**
 - Section III: **Current Irrigation System & Practice**
 - Section IV: **Project Types**
 - Section V: **Project Duration**
 - Section VI: **Proposed Irrigation System & Practice**
 - Section VII: **Water Calculations**
 - Section VIII: **GHG Calculations**
 - Section IX: **Additional Considerations** (*optional*)

Application Attachments

- Project Design**
- Budget Worksheet**
<https://www.cdfa.ca.gov/oefi/sweep/docs/2017-SWEEP-BudgetWorksheet.xlsx>
- SWEEP Irrigation Water Savings Assessment Tool**
<https://www.cdfa.ca.gov/oefi/sweep/docs/IrrigationWaterSavingsAssessmentTool.xls>
- ARB GHG Calculator Tool**
https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/cdfa_sweep_finalcalc_16-17.xlsx
- GHG Baseline Use Documentation** (*e.g. utility bills, fuel receipts, field operational logs, etc. covering at least 6 months of peak irrigation season*)
- Pump Efficiency Test** (*pump efficiency test for current pumps, pump and motor specifications for any proposed pumps*)

Optional Application Attachments (*only if applicable to project*)

- Matching Funds** (*optional*)
- All Other Supplemental Documents** (*e.g., irrigation training certificates*) (*optional*)

Appendix B: Grant Application Questions



FINANCIAL ASSISTANCE APPLICATION SUBMITTER

Welcome [REDACTED] of California Department of Food and Agriculture - Federal Funds

[Help](#) | [Logout](#)

Management Office. If this is not your Account, please log out.

Questions Preview

This screen displays a "**Preview of Application/Survey Questions**" entered by the FAAST or RFP administrator. This Preview displays what the applicant /survey taker or reviewer would see while filling out the questionnaire or the review sheet.

To filter questions by funding program, please select a funding program from drop-down. The page will refresh and questions specific to the selected funding program will be displayed.

Filter by Funding Program: All

SECTION I: PREVIOUSLY FUNDED PROJECT

1. Has your agriculture operation received a previously funded SWEEP project?

a. If yes, provide the SWEEP Agreement Number(s) and corresponding Assessor's Parcel Number(s) of where each of the project(s) were implemented.

Answer: Select a Value

Answer:

Maximum of 500 characters.

SECTION II: PROPERTY INFORMATION

2. Indicate the total size of the applicant's farm/agricultural organization (acres).

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

3. Indicate the property location(s) of where the project will be implemented. Provide property information for each Assessor's Parcel Number (APN) that will be impacted by the proposed SWEEP project.

a. Assessor's Parcel Number(s)

IMPORTANT REMINDER: Be sure to use the APN format that is used by your county Assessor's Office. Visit your county's Assessor's Office in person or the Assessor's Office webpage to look up or verify the

APN(s).

Answer:

Maximum of 1000 characters.

b. Address or Nearest Cross Streets

Answer:

Maximum of 500 characters.

c. City, Zip Code

Answer:

Maximum of 500 characters.

d. County

Answer:

Maximum of 500 characters.

e. Census Tract

To identify the census tract of each APN use the census tract finder at:

<http://maps.gis.ca.gov/cdfa/tractfinder.html>

Answer:

Maximum of 1000 characters.

f. List current crop(s) and corresponding acreage impacted.
(Example: Alfalfa: 80 acres)

Answer:

Maximum of 500 characters.

4. Indicate if the property location(s) water source is surface water (i.e., water delivered to the property) or groundwater pumped from on-farm wells. If the property utilizes both surface water and groundwater, provide an estimate of the percentage from both sources (example: surface water 50%, groundwater 50%)

Answer: Select a Value

Answer:

Maximum of 500 characters.

SECTION III: CURRENT IRRIGATION SYSTEM & PRACTICE

The questions in Section III apply to the current irrigation and/or distribution system. The purpose of this section is to understand an applicant's current water use system.

5. Description of current water use system

Describe in detail the current water use system and associated energy sources. At a minimum, applicants should address the current crop, irrigation type, irrigation management practices (e.g., ET irrigation scheduling using CIMIS and/or sensors), fuel source(s), and water source(s).

Answer:

Maximum of 1000 characters.

6. Is current water use measured either on farm or by the water supplier (e.g., with a flow meter)?

Explain how water use is or is not measured.

Answer: Select a Value

Answer:

Maximum of 500 characters.

SECTION IV: PROJECT TYPES

The questions in Section IV apply to the project types for which the applicant is applying for SWEEP funds.

7.

Project Types

Address all applicable project types and provide an explanation for all types selected. Only indicate project types that are being incorporated as part of the project.

NOTE: Do not indicate a project type if it is already the current practice at the project site.

Water Conservation

a. **Weather, Soil or Plant based sensors for irrigation scheduling**

Examples include soil moisture or plant sensors (NRCS Conservation Practice Standard 449) with electronic data output or electronic weather station linked to irrigation controller, for growers to ensure efficient irrigation scheduling. Use of ET based irrigation scheduling, such as the California Irrigation Management Information System (CIMIS) on existing or proposed projects to optimize water efficiency for crops. Telemetry components that allow the electronic communication between technology devices are eligible.

If yes, provide a detailed explanation.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

b. **Micro-Irrigation or Drip Systems**

Use of micro-irrigation or drip systems, including sub-surface drip systems. Should follow NRCS Conservation Practice Standard 441.

If yes, provide detailed explanation.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

Greenhouse Gas Emission Reduction

c. Fuel Conversion

The conversion of a fossil fuel pumps to solar, wind, electric, or natural gas resulting in a reduction of carbon dioxide GHG emissions. Renewable energy, including solar, installations that power irrigation systems are eligible.

If yes, provide detailed explanation.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

d. Improved Energy Efficiency

Examples include retrofitting or replacing pumps. NRCS Conservation Practice Standard 372 or 533 may apply.

If yes, provide detailed explanation.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

e. Low Pressure Systems

Use of low pressure irrigation systems to reduce pumping and energy use. For example, the conversion of a high pressure sprinkler system to a low pressure micro-irrigation system or lower pressure sprinkler system. Should follow NRCS Conservation Practice Standards 441 or 442.

If yes, provide detailed explanation.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

f. Variable Frequency Drives

Use of Variable Frequency Drives to reduce energy use and match pump flow to load requirements. Should follow NRCS Conservation Practice Standard 533.

If yes, provide detailed explanation.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

g. Reduced Pumping

For example, improved irrigation scheduling may lead to reduced pump operation times.

If yes, provide detailed explanation.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

h. Other Management Practices

For projects implementing any other management practices that will result in GHG reductions and water savings.

If yes, provide detailed explanation.

Reminder: GHG emission reductions must be calculated according to the ARB GHG Quantification Methodology and with the ARB Calculator Tool.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

SECTION V: PROJECT DURATION

The maximum grant duration for a proposed project is 12 months. SWEEP projects must not start before June 1, 2017 or after May 31, 2018.

8. Estimate the "Start Date" for the proposed project

Answer:



Estimate the "End Date" for the proposed project

Answer:



SECTION VI: PROPOSED IRRIGATION SYSTEM & PRACTICE

The questions in Section VI apply to the proposed water use system on the property. The purpose of this section is to estimate the potential water savings and reductions in greenhouse gas emissions.

9. Description of proposed water use system

Explain in detail the proposed water use system and associated energy sources. At a minimum, applicants should address the proposed crop, irrigation type, irrigation management (e.g., ET irrigation scheduling using CIMIS and/or sensors), fuel source(s), and water source(s).

Answer:

Maximum of 1000 characters.

10.

All projects must allow for water to be measured after project implementation. Provide an explanation of how the proposed project will measure applied water after the project is installed.

Reminder: All applicants must attach the completed budget worksheet and a project design.

Answer:

Maximum of 500 characters.

Before proceeding with the application, applicants must complete the SWEEP Irrigation Water Savings Assessment Tool and the ARB GHG Calculator Tool. Upon completing the calculators, applicants will need to refer to the completed calculators to answer questions 11 through 13.

SECTION VII: WATER CALCULATIONS

Applicants must use the SWEEP Irrigation Water Savings Assessment Tool to provide an estimate of current baseline water use and the estimated water savings due to the proposed project. Use the units of acre-inches per year per acre. Instructions are provided on the "Instructions" tab of the SWEEP Irrigation Water Savings Assessment Tool.

11. Using the SWEEP Irrigation Water Savings Assessment Tool

- a. What is the Estimated Before Scenario Water Use (acre-inches/acre) from the SWEEP Irrigation Water Savings Assessment Tool, located in cell F3 of the "Water Savings Estimate" tab?

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

- b. What is the estimated water savings (acre-inches/acre) from the project, located in cell F5?

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

- c. Are there any further comments or clarifications regarding the supporting water documentation or calculations? Indicate "Yes" or "No." If "Yes," provide your explanation.

Reminder: The completed SWEEP Irrigation Water Savings Assessment Tool workbook must be attached.

Answer: Select a Value

Answer:

Maximum of 1000 characters.

SECTION VIII: GHG CALCULATIONS

Applicants are required to use the ARB GHG Calculator Tool, which can be found [HERE](#), to quantify GHG reductions from their proposed project.

Attach the entire completed Excel workbook, and attach all supporting documents that provide inputs to the calculator, including pump efficiency tests, pump and motor specifications, actual fuel invoices, electric bills, and field operational logs.

After completing all required tabs and saving and attaching the tool, provide a response to the following questions:

12. Current baseline greenhouse gas emissions

- a. What is the *total* baseline fuel or electricity use for all the fields involved in the proposed SWEEP project? This information is located in cell B14 of the "Input" tab(s) of the workbook. Complete all that apply below.

- i. Electricity (kwh/yr)

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

ii. Diesel (gallons/yr)

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

iii. Motor gasoline (gallons/yr)

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

iv. Biodiesel/renewable diesel (gallons/yr)

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

v. Natural gas (scf/yr)

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

vi. Solar (kwh/yr)

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

vii. Wind (kwh/yr)

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

viii. Other renewable (kwh/yr)

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

b. Explain how the supporting baseline GHG documents (such as fuel invoices, electricity bills, pump efficiency tests, etc.) were used to provide inputs to the ARB GHG Calculator Tool. In other words, provide a sufficient explanation to identify inputs of the GHG Calculator to allow the calculations to be replicated.

Answer:

Maximum of 1000 characters.

c. Are field operational logs attached? If "Yes," explain how those logs were maintained and how data was collected on-farm. Note: If field operational logs were used, the logs **MUST** be attached as supporting documentation.

Answer: Select a Value

Answer:

Maximum of 500 characters.

13.

Indicate the estimated greenhouse gas emission reductions from the project (Tonnes of CO2 equivalent/acre), located in cell B16 of the "Summary" tab of the ARB GHG Calculator Tool.

Reminder: Applicants are required to attach the completed ARB GHG Calculator Tool, the SWEEP Irrigation Water Savings Assessment Tool, and all supporting on-farm documents that were used to provide inputs to the ARB GHG Calculator Tool such as pump efficiency tests, pump specifications, fuel invoices, electric bills, etc.

Answer:

Please do not use comma (,) and enter a number between 0 and 99999999

SECTION IX: ADDITIONAL CONSIDERATIONS

Section IX is not required, but the following will receive additional consideration.

14.

Training

If awarded funding, will a representative from the agriculture operation agree to attend the training? If "Yes," indicate the training course and the agriculture operation representative(s) planning to attend.

IMPORTANT REMINDER: If the answer is indicated as "Yes," irrigation training will become a term of the Grant Agreement if the project is awarded funding. This training will be at the cost of the agriculture operation.

Answer: Select a Value

Answer:

Maximum of 500 characters.

15.

Critically Over-drafted Groundwater Basin

Does the project location fall within a critically over-drafted groundwater basin as identified by the Department of Water Resources? If "Yes," click [HERE](#) to identify the basin number.

Answer: Select a Value

Answer:

Maximum of 500 characters.

16. Soils Management Practices for Increasing Water-Holding Capacity

Indicate which, if any, of these management practices will be implemented with the goal of increasing soil organic matter and water-holding capacity of the soil.

IMPORTANT REMINDER: If these practices are selected and additional consideration is awarded, the selected practices will become a term of the Grant Agreement and are at the cost of the agricultural operation (these soil management practices are not eligible for funding through SWEEP).

Select all that apply.

- a. Cover cropping
- b. Mulching
- c. Compost application
- d. Resource conserving crop rotation

Answer: a b c d

17. Matching Funds(attachment):

Have matching funds (cash and/or in-kind contributions) been secured? Select "YES" or "NO." If "YES," attach documentation. Documentation should confirm the contribution source, type, and amount of contributions in support of the project.

Answer: Select a Value

Appendix D

California Air Resources Board

**Greenhouse Gas Quantification Methodology for the
California Department of Food and Agriculture
State Water Efficiency and Enhancement Program**

**Greenhouse Gas Reduction Fund
Fiscal Year 2016-17**



January 11, 2017

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Section A. Introduction

The goal of California Climate Investments is to reduce greenhouse gas (GHG) emissions and further the purposes of the Global Warming Solutions Act of 2006, known as Assembly Bill (AB) 32. The California Air Resources Board (ARB) is responsible for providing the quantification methodology to estimate the GHG emission reductions and other benefits from projects receiving monies from the Greenhouse Gas Reduction Fund (GGRF). ARB develops these methodologies based on the project types eligible for funding by each administering agency as reflected in the program Expenditure Records available

at: <https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/expenditurerecords.htm>.

ARB staff 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.

For the California Department of Food and Agriculture (CDFA) State Water Efficiency and Enhancement Program (SWEEP), ARB staff developed this quantification methodology and SWEEP GHG Calculator Tool to provide methods for estimating GHG emission reductions of each proposed project (Section B), provide instructions for documenting and supporting the estimate (Section C), and outline the process for tracking and reporting GHG and other benefits once a project is funded (Section D).

This methodology uses calculations to estimate the GHG emission reductions from on-farm pump and motor enhancement and/or replacement, irrigation system enhancement, and fuel conversion associated with implementation of SWEEP projects. These calculations are based on the current understanding of irrigation practices, irrigation system enhancements, fuel conversions, and GHG emission factors. Projects will report the total project GHG emission reductions estimated using this methodology as well as the total project GHG emission reductions per dollar of GGRF funds requested.

ARB released the draft quantification methodology and SWEEP GHG Calculator Tool for public comment in November 2016. This FY 2016-17 quantification methodology and accompanying GHG emission reduction calculator have been updated to reflect CDFA Program updates and public comments received.

SWEEP Project Types

ARB developed three project types that meet the objectives of the SWEEP and for which there are methods to quantify GHG emission reductions. Each project requesting GGRF funding must include at least one of the following project components for FY 2016-17:

- Pump and motor enhancement and/or replacement
- Irrigation system enhancement
- Fuel conversion

[Per SWEEP Program Guidelines:](#)

Eligible projects must:

- Reduce GHG emissions; and
- Reduce 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 reduce GHG emissions are not considered an eligible project.

Section B of this quantification methodology details the methods to use based on the project component(s) proposed.

Methodology Development

ARB and CDFA developed this quantification methodology consistent with the implementation principles of California Climate Investments, including ensuring transparency, accountability, and outreach and access for disadvantaged communities as described in ARB's Funding Guidelines for Agencies that Administer California Climate Investments (Funding Guidelines).¹ ARB and CDFA developed this quantification methodology through a public process to be used to estimate the outcomes of proposed projects, inform project selection, and track results of funded projects. The implementing principles ensure that the methodology would:

- Apply at the project-level;
- Provide uniform methods to be applied statewide, and be accessible by all applicants;
- Use existing and proven tools and methods;
- Use project-level data, where available and appropriate; and
- Result in GHG emission-reduction estimates that are conservative and supported by empirical literature.

ARB reviewed peer-reviewed literature and tools, and consulted with experts, as needed, to determine methods appropriate for the SWEEP project types. ARB also consulted with CDFA to determine project-level inputs available. The methods were developed to provide estimates that are as accurate as possible with data readily available at the project level.

Tools

This quantification methodology and the SWEEP GHG Calculator Tool rely on project-specific outputs from the following tools:

A SWEEP Irrigation Water Savings Assessment Tool (SWEEP Water Savings Tool) is used to estimate the potential water savings of SWEEP projects. This calculator was modeled after an existing tool used by conservationists at the United States Department

¹ Funding Guidelines for Agencies Administering California Climate Investments. December 21, 2015. www.arb.ca.gov/cci-fundingguidelines.

of Agriculture (USDA) National Resource Conservation Service (NRCS), but has been modified for use by SWEEP applicants. For projects that reduce water use and pump demand, applicants will use this tool to estimate water savings from proposed irrigation system enhancements. The water savings estimate determined by the SWEEP Water Savings Tool is used as an input in the SWEEP GHG calculator tool. The tool can be accessed

at: <https://www.cdfa.ca.gov/oefi/sweep/docs/IrrigationWaterSavingsAssessmentTool.xls>.

Applicants must use this quantification methodology, in conjunction with the accompanying SWEEP GHG Calculator Tool, to estimate the GHG emission reductions of the proposed project. The SWEEP GHG Calculator Tool can be downloaded from: www.arb.ca.gov/cc-quantification.

Major Updates

ARB updated this quantification methodology from the previous version.² The major changes include:

- General changes to document formatting and GGRF program language.
- Changes to reflect updates to the SWEEP Water Savings Tool.
- Updates to instructions and examples, where applicable.

ARB also updated the accompanying SWEEP GHG Calculator Tool from the previous version.³ The major changes include:

- General changes to the inputs required and the output metrics generated.
- General changes to make the SWEEP GHG Calculator Tool more user-friendly.

Program Assistance

ARB staff, CDFA staff, and SWEEP technical reviewers will review the quantification portions of the SWEEP project applications to ensure that the methods described in this document were properly applied to estimate the GHG emission reductions for the proposed 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: <https://www.arb.ca.gov/auctionproceeds>.
- Questions pertaining to the SWEEP should be sent to grants@cdfa.ca.gov.

² Greenhouse Gas Quantification Methodology for the California Department of Food and Agriculture State Water Efficiency and Enhancement Program FY 2015-16. Released March 15, 2016.

³ Greenhouse Gas Emission Reduction Calculator (Version 2) for the California Department of Food and Agriculture State Water Efficiency and Enhancement Program FY 2015-16. Released July 22, 2016.

Section B. Greenhouse Gas Quantification Methodology

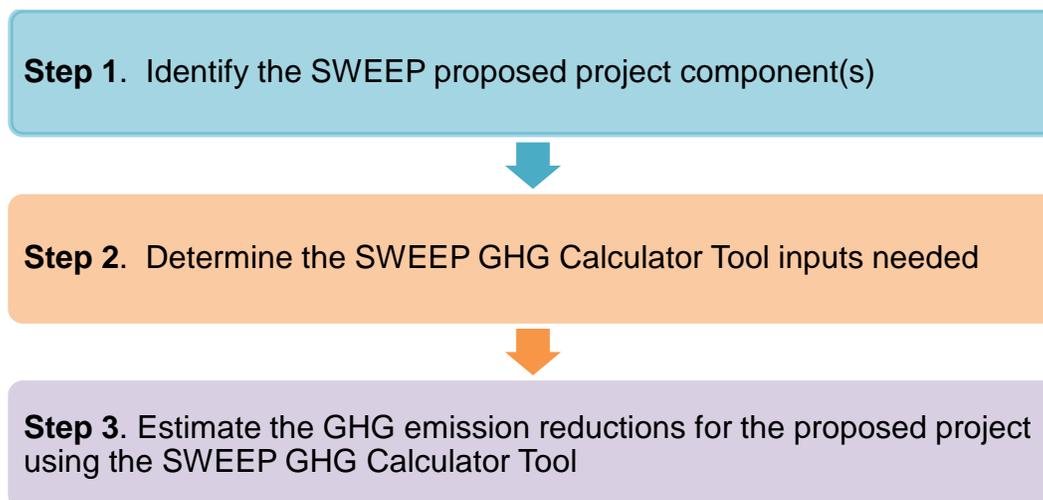
This quantification methodology accounts for GHG emission reductions of a proposed SWEEP project based on reduction in on-farm energy use as a result of pump and motor enhancements and/or replacement, reductions in pump demand from irrigation system enhancements, and fuel conversion (i.e., to a less carbon intensive fuel or installation of on-site renewable energy generation). In general, the GHG emission reductions are calculated using the following approaches:

Table 1. General Approach to GHG Quantification by Project Type

Pump and Motor Enhancements
<i>GHG Emission Reductions = GHG Emissions of Old Pump – GHG Emissions of New Pump (Including VFD)</i>
Irrigation System Enhancements (for systems utilizing pumps)
<i>GHG Emission Reductions = GHG Emissions Reductions of Pump Operation for Reduction in Water Use</i>
Fuel Conversions and Renewable Energy
<i>GHG Emission Reductions = GHG Emissions of Displaced Fuel or GHG Emission Reductions from Less Carbon Intensive Fuel</i>

Applicants will follow the steps outlined in Figure 1 to estimate the GHG emission reductions from the proposed project. Detailed instructions for each step are provided on subsequent pages.

Figure 1. Steps to Estimating GHG Emission Reductions



Step 1: Identify the Project Components and Appropriate Methods for the Proposed Project

For GHG quantification purposes, eligible SWEEP projects consist of several potential project components. Applicants may incorporate more than one project component and can use multiple methods identified in this quantification methodology, as appropriate, to quantify the GHG emission reductions. Applicants must identify the project components that apply to the project as identified in the 2016 SWEEP “Request for Grant Applications” (i.e., guidelines) or from Table 2 of this document. All projects must achieve energy use reductions and result in water use reductions. To achieve both objectives, projects may require multiple components. The project components identified will determine which subsections of this quantification methodology and sections of the accompanying GHG Calculator Tool must be used in order to estimate the GHG emission reductions.

Each calculation is for a single irrigated plot with a dedicated pump. For projects with additional pumps being upgraded or multiple plots, applicants must perform calculations on the additional Inputs tabs for each pump or individual plot. Project acreage and funding requested needs only to be included once for a project (i.e., in the first Input tab). Total GHG Emission Reductions are displayed as a cumulative total of each Input tab in the Summary Tab.

Table 2. Project Components and Appropriate Quantification Methods

Pump and Motor Enhancements
Install a variable frequency drive (VFD) (booster pump or well pump)
Motor replacement or efficiency improvement
Pump replacement or efficiency improvement
Irrigation System Enhancements (for systems utilizing pumps)
Install or modify irrigation system that results in a reduction in system pressure
Install automated irrigation system, scheduling, soil moisture sensors, or other techniques to reduce water use that reduce pump demand
Fuel Conversions and Renewable Energy
Change fuel types to less carbon intensive fuel (in conjunction with water savings measures)
Install renewable energy on-site to offset fuel use

Step 2: Determine the SWEEP GHG Calculator Tool Inputs Needed

Table 3 identifies the required data inputs needed to estimate the GHG emission reductions for proposed projects with the SWEEP GHG Calculator Tool by project component. Links for the SWEEP GHG Calculator Tool and SWEEP Water Savings Tool calculator are available in Section A. Introduction, Tools. Instructions for using the SWEEP Water Savings Tool are included within the tool on the **Instructions** tab.

Table 3. Required SWEEP GHG Calculator Tool Inputs for Eligible Project Components

All Projects
<p>General Information (Read Me worksheet)</p> <ul style="list-style-type: none"> • Project name; • Project ID – FFAST; • Contact Name; • Contact Phone Number; • Contact Email; and • Date Completed. <p>Existing Conditions (prior to any project modification)</p> <ul style="list-style-type: none"> • Total Irrigated Project Area (acres); • Total GGRF funds requested (\$); • Pump fuel amount or electricity use (gallons, therms, or kWh); and • Fuel type.
Pump and Motor Enhancements
<p>Greenhouse Gas Quantification Inputs (both pre-project values and post-project estimates) (Inputs worksheet)</p> <ul style="list-style-type: none"> • Motor Rated Horsepower (hP); • Operational hours in a growing season; this parameter is only needed for pre-project scenario for determining baseline energy demand if energy use data is unavailable; • Overall Pumping Efficiency (%); and • System Pressure, in units of feet, determined from the following user inputs: <ul style="list-style-type: none"> ○ Pumping depth (ft) – this is depth from which groundwater is pumped ○ Discharge pressure from pump (ft) ○ Friction losses (ft); if unknown, use a default of 10 ft for well pumps and 5 ft for booster pumps <p><i>Note: If pressures are known in units of pounds per square inch (psi), the calculator tool provides a mechanism for conversion to units of feet.</i></p> • If a VFD will be installed, specify appropriate VFD scenario (booster or well)
Irrigation System Enhancements (for systems utilizing pumps)
<p>Greenhouse Gas Quantification Inputs (Inputs worksheet)</p> <ul style="list-style-type: none"> • Water savings, as estimated in cell F6 on the Summary tab of the SWEEP Water Savings Tool (%). If the project includes system repairs preventing leakage, these values should be captured in the SWEEP Water Savings Tool.

Fuel Conversions and Renewable Energy

Greenhouse Gas Quantification Inputs (Inputs worksheet)

- New fuel type if converting to a different fuel; and
- Capacity of renewable energy installations (kW).
Note: The renewable energy capacity is not the expected output.
- If converting fuels, enter the change from the drop down menu in the ARB GHG calculator tool.

Step 3: Estimate GHG Emission Reductions for the Proposed Project Using the SWEEP GHG Calculator Tool

Applicants must use the SWEEP GHG Calculator Tool to complete this step. The Calculator Tool can be downloaded from www.arb.ca.gov/cci-quantification. The applicant will enter the project details into the SWEEP GHG Calculator Tool to calculate the GHG emission reductions over the useful life⁴ using the inputs identified in Step 2.

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 documents. Please use the following file naming convention: “[FAAST ID]_[Project Name]” not to exceed 20 characters.

Project Name:	Smith Brother Farm
Project ID - FFAST:	12-3456789
Contact Name:	John Smith
Contact Phone Number:	916-555-1234
Contact Email:	john@smithbros.com
Date Completed:	12/1/2016
Total Irrigated Project Area (acres):	100
Total GGRF funds requested (\$):	\$ 100,000

Inputs Tab

Headers in **red** indicate a field that requires input by the project applicant. For each project component section, please complete all relevant data. For example, if the project is not making changes to the pump or motor, the existing pump information will still be utilized in determining energy reductions from irrigation system enhancements. If applicants are implementing more than one project or their project impacts more than one pump or well site, the applicant should run the calculator tool for each pump or well site impacted. Project acreage and funding requested needs only to be included once for a project, in the first Input tab. Definitions are provided in the **Definitions** tab. Inputs must be substantiated in the documentation provided in accordance with Section C. Documentation.

⁴ For purposes of SWEEP projects, the life of a proposed project (i.e., useful life) is defined as the number of years recipients are expected to use and maintain their system. The default useful life for these projects is 10 years.

Summary Tab

The **Summary** tab identifies the annual and useful life GHG emission reductions associated with SWEEP project enhancements. In addition, the total GGRF funds awarded, Total GHG emission reductions per acre, and the reporting metric of the project are summarized.

- **Net GHG Benefits over Useful Life** is equal to the sum total of each of the GHG emission reductions calculated in Section B and are automatically summed over the useful life in the SWEEP GHG Calculator Tool.
- **Total GHG Emission Reductions per Total GGRF Funds Requested** is calculated as:

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

Project Name:	0
Tax ID:	0

Results	GHG Emissions (MTCO2e)	Description
GHG Benefits per Growing Season		Annual GHG Emission Reductions (MTCO2e/yr)
Net GHG Benefits over Useful Life		Total GHG Emission Reductions (MTCO2e)
GHG Benefits per Acre-Year		Total GHG Emission Reductions (MTCO2e) per Acre per Year
Total GGRF Funds Requested (\$)		Total SWEEP funds requested
Total GHG Emission Reductions per Total GGRF Funds Requested (\$)		Total Reductions per SWEEP funds requested

Section C. Documentation

In addition to SWEEP application requirements, applicants for GGRF funding are required to document results from the use of this quantification methodology, including supporting materials to verify the accuracy of project-specific inputs.

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 agency staff.

The following checklist is provided as a guide to applicants; additional data and/or information may be necessary to support project-specific input assumptions.

	Documentation Description	Completed
1.	Project Application	
2.	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	
3.	Populated SWEEP GHG Calculator Tool file (in.xls) with worksheets applicable to the project populated (ensure that the Total Project GHG Emission Reductions and Total Project GHG Emission Reductions/SWEEP GGRF Funds Requested fields in the summary worksheet contain calculated values)	
4.	Project data support, including: <ul style="list-style-type: none"> • Calculator inputs determined in Step 2; • Documentation of the project data used to support SWEEP GHG Calculator Tool inputs (i.e., energy use, pump and motor specifications, and water savings estimates (SWEEP Water Savings Tool)); • References to public documents that are the source of the project data; and • Any other information as necessary and appropriate to substantiate inputs 	

Section D. Reporting after Funding Award

Accountability and transparency are essential elements for all GGRF California Climate Investment projects. As described in ARB's Funding Guidelines, each administering agency is required to track and report on the benefits of the California Climate Investments funded under their program(s). Each project funded by the GGRF is expected to provide real and quantifiable GHG emission reductions. The previous sections of this document provide the methods and tools to estimate the GHG emission reductions of a proposed project based on project characteristics and assumptions of expected conditions and activity levels. This section explains the minimum reporting requirements for administering agencies and funding recipients during project implementation, termed Phase 1, and after a project is completed, termed Phase 2. Table 4 below shows the project phases and when reporting is required.

Table 4. Quantification and Reporting By Project Phase

	Timeframe & Reporting Frequency	Quantification Methods
Project Selection	Period from solicitation to selection of projects and funding awards. Applicant submits application to SWEEP by due date in solicitation materials.	All applicants use methods in ARB's quantification methodology to estimate the GHG emission reductions of the project.
Phase 1	Covers the period from the beginning of the project until it becomes operational or the initial implementation is completed.	All awarded projects use methods in ARB's quantification methodology to update initial estimate of GHG emission reductions, as needed, based on project changes.
Phase 2	Starts after Phase 1 is complete and a project becomes operational.	GHG reduction achieved are quantified and reported for a subset of funded projects.

Phase 1 reporting is required for all SWEEP funded projects. CDFA will collect and submit data to ARB to satisfy Phase 1 reporting requirements. Funding recipients must report any changes that impact GHG emission reduction estimates (i.e. assumptions or quantities) 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 fields 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 is a hypothetical project⁵ to demonstrate how the FY 2016-17 SWEEP Program Quantification Methodology would be applied. This example does not provide examples of the supporting documentation that is required of actual project applicants.

Overview of the proposed project

A 100 acre farm in the Central Valley utilizes a high pressure solid set sprinkler system to irrigate vegetable crops. The farmer sources irrigation water primarily from an on-site groundwater well that employs an older, inefficient vertical turbine pump rated at 100 horsepower (hP) used in conjunction with a diesel motor. A pump test reported an overall pumping efficiency of 70%. Through CDFA's SWEEP grant program, the farmer proposes to convert the existing high pressure irrigation system to a low pressure micro-drip irrigation system. The farmer also proposes to replace the inefficient diesel motor/pump system with a new and more efficient electric motor/pump system rated at 80 hP with a VFD controller. In addition, the farmer proposes to install 20 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 SWEEP GHG Calculator Tool.

Methods to apply

Step 1. Identify the SWEEP Proposed Project Type(s)

The first step is to identify applicable project components that will reduce both GHG emissions and water usage. CDFA has identified applicable project components in the SWEEP guidelines. In addition, Table 1 of this document provides a list of the most common eligible project components expected to be funded under SWEEP. The applicant must identify at least one project component from the list of applicable project components that defines the proposed project. All projects must both achieve energy use reductions to achieve GHG emission reductions and water use reductions. To achieve both objectives, many projects will include multiple components. The project components identified will inform the sections of the SWEEP GHG Calculator Tool required to determine GHG emission reductions. Each calculation is for a single irrigated plot with a dedicated pump. For projects with multiple plots, applicants must perform calculations for each individual plot and submit each run as well as a cumulative value for net GHG emission reductions.

In the above example, the project applicant identified irrigation system conversion that reduced system pressure and reduce water usage, motor/pump system replacement to improve system efficiency, VFD controller installation, and solar PV installation to provide renewable energy.

⁵ The hypothetical project has not undergone verification of any SWEEP Program requirements; all assumptions about location type and features are for quantification methodology demonstration purposes only.

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

The applicant determines all of the required inputs from Table 2 for the SWEEP GHG Calculator Tool to estimate GHG emission reductions. The next step for the applicant is to review the **Read Me** tab of the SWEEP 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 Farm
Project ID - FAAST:	12-3456789
Contact Name:	John Smith
Contact Phone Number:	916-555-1234
Contact Email:	john@smithbros.com
Date Completed:	12/1/2016
Total Irrigated Project Area (acres):	100
Total GGRF funds requested (\$):	\$ 100,000

Next, the applicant enters in the identified proposed project information for both pre-project and post-project cases into the SWEEP GHG Calculator Tool in the **Inputs** 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 SWEEP GHG Calculator Tool from the example proposed project.

General Project Information

The “General Project Information” section is required for every applicant. Each project descriptor must have the associated project input.

General Project Information	
Input Data	Pre-Project
Field or Ranch Name	West Field
Pump fuel or electricity use (gallons, scf, kWh)	5,000
Fuel type	Diesel
Fuel Emissions Factor	0.013717

Pump and Motor Enhancement and Replacement

This section is required for proposed projects that incorporate improvements to the irrigation pump system. If pressures are not known in units of feet, please utilize the green “Pressure Conversion” tab to convert pressure into units of feet.

Pump and Motor Enhancement and Replacement - This Section required for all applicants		
Input Data	Pre-Project	Post-Project
Motor Rated Horsepower (hP)	100	80
Operational Hours (hr) (if Known) - If unknown, leave cell blank		
Overall Pumping Efficiency (%)	75%	75%
System Pressure (ft)	User may override system pressure if known.	User may override system pressure if known.
Pumping depth (ft)	350	350
Discharge pressure (ft)	100	50
Friction losses (ft)	10	10
Are you installing a VFD?	N/A	VFD Well Pump

Irrigation System Enhancement (for systems utilizing pumps)

This section is required for irrigation system modifications and improvements that result in water savings. Water savings results are determined from the SWEEP Water Savings Tool (as described in the CDFA SWEEP Guidelines), accessible at: <https://www.cdfa.ca.gov/oefi/sweep/docs/IrrigationWaterSavingsAssessmentTool.xls>. The SWEEP Irrigation Water Savings estimate in percentage (%) is the value used for this calculator. Estimated water savings from leakage repair is calculated as part of the SWEEP Water Savings Tool.

Irrigation System Enhancement (for systems utilizing pumps)		
Input Data	Pre-Project	Post-Project
Water Savings (SWEEP Water Savings Tool) (%)	N/A	20%

Fuel Conversions and Renewable Energy

This section is required for pump system fuel conversions and renewable energy installations. Below are sample inputs (post-project) for the example SWEEP proposed project.

Fuel Conversions and Renewable Energy		
Input Data		Post-Project
Renewable energy capacity (kW)		20
New fuel type		Electricity
Fuel Emissions Factor		0.000379
Fuel conversion		Diesel to Electricity
Conversion Factor		0.303205568

The applicant can select the “GHG Calculations” Tab to view the estimated project GHG emission reductions.

Submit Documentation

To complete the quantification process, the applicant must submit an electronic copy of the calculator (in .xls, .xlsm, or .xlsx) and all of the required documentation as noted in Section C. The summary documentation that provides the GHG emission reductions from the project can be found in the **Summary** tab of the SWEEP GHG Calculator Tool.

For this example, the Annual GHG Emission Reductions (MTCO₂e) is equal to the difference between GHG emissions pre-project and the GHG emissions post-project, accounting for the installation of on-site renewable energy. Total GHG Emission Reductions (MTCO₂e) is the annual reductions multiplied by the expected useful life of the installed equipment using a default value, as defined by CDFA, of 10 years. The applicant in this example would report the Net GHG Benefits over the Useful Life as 733.37 MTCO₂e.

The SWEEP Funds Requested (\$) is equal to the total GGRF funds requested. In this example, the amount is \$100,000. The total GHG emission reductions (MTCO₂e) per GGRF funds represent the benefits over Useful Life per dollar requested. For this example this value would be 0.0073 MTCO₂e per GGRF \$.

Quantification Methodology for the CDFA FY 2016-17 SWEEP

Results	GHG Emissions (MTCO ₂ e)	Description
GHG Benefits per Growing Season	71.11	Annual GHG Emission Reductions (MTCO ₂ e/yr)
Net GHG Benefits over Useful Life	711.07	Total GHG Emission Reductions (MTCO ₂ e)
GHG Benefits per Acre-Year	0.71107	Total GHG Emission Reductions (MTCO ₂ e) per Acre per Year
Total GGRF Funds Requested (\$)	\$ 100,000	Total SWEEP funds requested
Total GHG Emission Reductions per Total GGRF Funds Requested (\$)	0.0071	Total Reductions per SWEEP funds requested

Appendix B. Equations Supporting the SWEEP GHG Calculator Tool

Methods used in the SWEEP GHG Calculator Tool for estimating the GHG emission reductions by activity type are provided in this appendix. The GHG emission reductions from the project are quantified within the SWEEP GHG Calculator Tool using the equations below.

A. Irrigation System Pressure Changes

Equation 1.a: Pre-Project Head (for use in Eq. 3.c and Eq. 4.a)

$$TDH_{pre\ project} = H_{pumping\ elevation\ pre\ project} + H_{discharge\ pressure\ pre\ project} + H_{friction\ loss\ pre\ project}$$

Equation 1.b: Post-Project Head (for use in Eq. 4.a)

$$TDH_{post\ project} = H_{pumping\ elevation\ post\ project} + H_{discharge\ pressure\ post\ project} + H_{friction\ loss\ post\ project}$$

<i>Where,</i>			<u>Units</u>
$TDH_{project}$	=	Total dynamic head or system pressure requirement, pre and post project	Feet
$H_{pumping\ elevation}$	=	Elevation head, the vertical distance which the water must be pumped, pre and post project	Feet
$H_{discharge\ pressure}$	=	Pressure head, is the maximum operating pressure of the water system converted from psi to feet of head, pre and post project	Feet
$H_{friction\ loss}$	=	Friction head loss, is the loss of pressure due to the flow of water through pipe and fittings, pre and post project. Default friction losses are estimated at 10 ft.	Feet

B. GHG Emissions from Motor and Pump Efficiency Improvements

(Eq. 2.a) GHG Emissions from Existing Pump for Non-Electric Pumps

$$GHG_{pre\ project} = Fuel\ Use \times EF_{fuel\ pre\ project}$$

(Eq. 2.b) GHG Emissions from Existing Pump for Electric Pumps with actual use data

$$GHG_{pre\ project} = Electricity\ Use \times EF_{electricity}$$

(Eq. 2.c) GHG Emissions from Existing Pump for Electric Pumps (if actual use data is unavailable)

$$GHG_{pre\ project} = HP_{pre\ project} \times \eta_{pre\ project} \times Operational\ Hours_{pre\ project} \times 0.746 \times EF_{electricity}$$

<i>Where,</i>			<u>Units</u>
$\eta_{project}$	=	Overall pumping plant efficiency, pre and post project	%
$\eta_{project}$	=	Overall pumping efficiency, pre and post project. This value	%

		incorporates pump efficiency and motor efficiency, among other factors.	
GHG _{pre project}	=	GHG emissions from existing pump	MTCO ₂ e
Fuel use	=	Pre project fuel use	Gallons or scf
EF _{fuel pre project}	=	Emission factor of pre project fuel	MTCO ₂ e per gallon or scf
Electricity use	=	Pre project electricity use	kWh
EF _{electricity}	=	Emission factor from electricity (0.000306 MTCO ₂ e/kWh) ⁶	MTCO ₂ e/kWh
HP _{pre project}	=	Pre project rated motor horsepower	hP
Operational Hours _{baseline}	=	Baseline irrigation hours based on plant requirements, area, and flow rate	Hours
0.746	=	Conversion from hP to kilowatts	kWh/hP

C. GHG Emissions from Post Project Pump Demand and Fuel Conversions

(Eq. 3.a) GHG Emissions from Post Project Pump Demand

$$GHG_{pump} = \left((1 - Water\ Savings_{SNRCS}) \times \frac{TDH_{post\ project}}{TDH_{pre\ project}} \times \frac{\eta_{pre\ project}}{\eta_{post\ project}} \times GHG_{pre\ project} \right)$$

(Eq. 3.b) GHG Emissions Adjustment for fuel conversions

$$GHG_{pump,adj} = GHG_{pump} \times \frac{EER\ Adjusted\ Carbon\ Intensity_{New\ fuel}}{EER\ Adjusted\ Carbon\ Intensity_{Old\ fuel}}$$

<i>Where,</i>			Units
GHG _{pump}	=	GHG emissions from pump changes	MTCO ₂ e
Water Savings	=	Water savings from SWEEP Irrigation Water Savings Assessment Tool, as found in cell F6 in the Summary tab.	%
GHG _{pump,adj}	=	GHG emissions from pump changes accounting for fuel conversions	MTCO ₂ e
EER Adjusted Carbon Intensity	=	Energy Economy Ratio lifecycle emission factor for fuel with an adjustment to reflect for the relative efficiency of a specific fuel used in a motor ⁷	g/MJ

⁶ For the purposes of GGRF quantification methodologies, ARB developed a California grid electricity emission factor based on total in-state and imported electricity emissions (MTCO₂e) divided by total consumption in MWh. Emissions from ARB GHG inventory (2013), available online at: http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_by_sector_00-12_sum_2014-03-24.pdf. Consumption data from CEC Energy Almanac (2013), available online at: http://energyalmanac.ca.gov/electricity/electricity_generation.html

⁷ EER adjusted CI values. Source: California Air Resources Board, [CAGREET 1.8b versus 2.0 CI Comparison Table](#), April 1, 2015

D. GHG Emission Reductions from VFD Installation and System Pressure Reductions

(Eq. 4.a) GHG Emission Reductions from VFD Installation (for Electric Pumps) with no changes in pressure demand from irrigation system changes

$$GHG_{VFD} = Energy\ Savings_{VFD} \times HP_{post\ project} \times EF_{electricity}$$

(Eq. 4.b) GHG Emission Reductions from VFD Installation (for Electric Pumps) accounting for reduced pressure demand from irrigation system changes

$$GHG_{VFD} = Energy\ Savings_{VFD} \times HP_{post\ project} \times (1 - Water\ Savings_{NRCS}) \times \left(1 - \frac{TDH_{pre\ project} - TDH_{post\ project}}{TDH_{pre\ project}} \right) \times EF_{electricity}$$

<i>Where,</i>		<u>Units</u>
GHG _{VFD}	= GHG emissions reductions from VFD installation	MT CO _{2e}
Energy Savings _{VFD}	= Energy savings for VFD installations (from DEER). The energy savings here incorporate an assumed VFD efficiency of 97% ⁸	kWh/hP
HP _{post project}	= Post project rated motor horsepower	hP

E. GHG Emissions Reductions from Installation of Renewable Energy

(Eq. 5) GHG Emission Reductions from pump (use GHG_{pump,adj} if applicable)

$$GHG_{Renew} = Capacity \times Capacity\ Factor_{solar} \times 8,766 \times EF_{electricity}$$

<i>Where,</i>		<u>Units</u>
Capacity	= Capacity of renewable energy installation	kW
Capacity Factor	= Statewide average of renewable performance, 18% ⁹	%
8,766	= Hours per year of renewable energy generation potential	Hours
GHG _{Renew}	= GHG emissions reductions from on-site renewable energy	MTCO _{2e}

⁸ United States Department of Agriculture, Natural Resources Conservation Service (January 2010). Engineering Technical Note No. MT-14, "Variable Speed Drive (VSD) for Irrigation Pumping." Available online at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_054026.pdf

⁹ 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>

F. GHG Emissions Reductions from SWEEP Project Implementation

(Eq. 6) GHG Emission Reductions from pump (use $GHG_{pump,adj}$ if applicable)

$$GHG_{post\ project} = GHG_{pre\ project} - GHG_{pump} + GHG_{VFD} + GHG_{Renew}$$

Where,
 $GHG_{post\ project}$ = GHG emissions reductions from the SWEEP project improvements compared to the previous irrigation system Units
MTCO₂e

Appendix C. Emission Factors

Fuel	CO ₂ e Emission Factor	Unit
Diesel	0.013717	MTCO ₂ e/gal
Natural Gas ¹⁰	0.0000793	MTCO ₂ e/scf
Electricity	0.000379	MTCO ₂ e/kWh
Biodiesel/Renewable Diesel ¹¹	0.006050	MTCO ₂ e/gal
Motor Gasoline ¹²	0.01141	MTCO ₂ e/gal
Solar Power	0	
Wind Power	0	
Renewable Other	0	

The emission factors for different fuel types are from ARB's Low Carbon Fuel Standard (LCFS) Program.¹³ LCFS fuel assessments include the direct emissions associated with producing, transporting, and using the fuels, as well as significant indirect effects on GHG emissions, such as changes in land use for some biofuels. LCFS provides carbon intensity (CI) values for each fuel type, expressed in grams of carbon dioxide equivalent per megajoule (gCO₂e/MJ). CI values are converted to appropriate units (as shown in the table above) using the applicable fuel energy densities and standard conversion rates (as shown below). Fuel conversions utilize the Energy Economy Ratio (EER) adjusted CI values to reflect the relative efficiency of a specific fuel used in a motor. Fuel conversions to renewable energy do not have a conversion value and are reflected in the renewable energy capacity installed.

Fuel Emission Factor

$$EF_{Fuel} = CI_{EER} \times ED_{Fuel} \times 10^{-6}$$

Energy Economy Ratio (EER)

$$CI_{EER} = \frac{CI_{fuel}}{EER}$$

Where,

EF _{fuel}	=	Emission factor of fuel	Units MTCO ₂ e/gal, scf, or kWh
CI _{EER}	=	EER adjusted CI value of fuel	gCO ₂ e/MJ
ED _{fuel}	=	Energy density of fuel	MJ/gal, scf, or kWh
CI _{fuel}	=	Carbon intensity of fuel	gCO ₂ e/MJ
EER	=	Reflects relative efficiency of fuel used in motor	dimensionless

¹⁰ The natural gas carbon intensity (CI) value used is a petroleum-based compressed natural gas (CNG) delivered via pipeline and compressed at the station. The emissions associated with compression are subtracted from the total CNG CI value. The compression CI value used is available at: https://www.arb.ca.gov/fuels/lcfs/022709lcfs_cng.pdf.

¹¹ The biodiesel/renewable diesel CI value used is an average of the biodiesel and renewable diesel CI values of feedstock derived from both animal fats and plant oils.

¹² The motor gasoline CI value used is the CI requirements of California reformulated gasoline (CaRFG) for years 2016-2020.

¹³ California Air Resources Board (ARB) Low Carbon Fuel Standard (LCFS) Program (final regulation effective January 1, 2016). Available online at: <https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf>.

Appendix E: USDA NRCS Payment Schedule

Adapted from USDA NRCS EQIP FY FY17 EQIP Payment Rate Summary List Regular Rates. Found at:

https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd416279&ext=pdf

This table provides the rates for some likely SWEEP project components. Other Conservation Practice Standards may also apply and be eligible for SWEEP funding.

Practice Code	Practice Name	Component	Unit Type	Unit Cost
372	Combustion System Improvement	IC Engine Repower, <= 25 bhp	BHP	\$229.61
372	Combustion System Improvement	IC Engine Repower, >25 bhp	BHP	\$166.06
372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, < 12 HP	Ea	\$1,011.22
372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, 12-69 HP	Ea	\$4,439.65
372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, 70-124 HP	Ea	\$5,569.86
372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, 125-174 HP	Ea	\$11,066.08
372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, 175-224 HP	Ea	\$16,751.78
372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, 225-274 HP	Ea	\$19,820.06
372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, 275-399 HP	Ea	\$26,545.16
372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, 400-499 HP	Ea	\$37,387.90

372	Combustion System Improvement	Electric Motor in-lieu of IC Engine, >= 500 HP	Ea	\$48,041.42
372	Combustion System Improvement	Mobile IC, 50-149 bhp	HP	\$282.32
372	Combustion System Improvement	Mobile IC, >= 150 bhp	HP	\$319.81
441	Irrigation System, Microirrigation	Vegetation Establishment	Ac	\$444.65
441	Irrigation System, Microirrigation	Orchard-vineyard, 10ac or less	Ac	\$1,295.98
441	Irrigation System, Microirrigation	Orchard-vineyard, >10ac	Ac	\$732.70
441	Irrigation System, Microirrigation	Orchard-vineyard, durable tubing replace	Ac	\$369.96
441	Irrigation System, Microirrigation	Small Acreage	Ac	\$1,792.41
441	Irrigation System, Microirrigation	Row Crop, Buried Manifold	Ac	\$1,000.19
441	Irrigation System, Microirrigation	Row Crop, Above Ground PE Manifold	Ac	\$890.47
441	Irrigation System, Microirrigation	Retrofit, Irrigation Automation	Ea	\$7,474.38
441	Irrigation System, Microirrigation	Filter replace	Ac	\$293.16
441	Irrigation System, Microirrigation	SDI (subsurface drip irrigation)	Ac	\$1,012.42
441	Irrigation System, Microirrigation	Orchard-vineyard, >10ac with automation	Ac	\$879.70
442	Sprinkler System	Center Pivot, < 600 Ft	LnFt	\$46.00
442	Sprinkler System	Center Pivot, > 600 Ft	LnFt	\$39.40
442	Sprinkler System	Linear Move System	LnFt	\$50.98
442	Sprinkler System	Wheel Line System	LnFt	\$9.98
442	Sprinkler System	Solid Set System	Ac	\$1,292.66

442	Sprinkler System	Solid Set System Renovation	Ac	\$197.16
442	Sprinkler System	Handline system	LnFt	\$3.53
442	Sprinkler System	Traveling Gun System, 2" or less diameter Hose	Ea	\$10,466.54
442	Sprinkler System	Traveling Gun System, >2" to 3" Hose	Ea	\$13,539.01
442	Sprinkler System	Traveling Gun System, > 3" Hose	Ea	\$25,000.94
442	Sprinkler System	Big Gun, Stationary	Ea	\$2,995.33
442	Sprinkler System	Pod System	Ea	\$284.57
442	Sprinkler System	Renovation of Existing Overhead or Wheel line Sprinkler System	LnFt	\$5.30
442	Sprinkler System	Retrofit, Irrigation Automation	Ac	\$493.36
442	Sprinkler System	Solid Set, above ground laterals	Ac	\$1,163.35
442	Sprinkler System	Solid Set System, with automation	Ac	\$1,736.73
449	Irrigation Water Management	Basic IWM <30 acres	Ea	\$568.89
449	Irrigation Water Management	Basic IWM >= 30 acres	Ac	\$23.29
449	Irrigation Water Management	Intermediate IWM <30 acres	Ea	\$853.34
449	Irrigation Water Management	Intermediate IWM >= 30 acres	Ac	\$34.99
449	Irrigation Water Management	Advanced IWM <30 acres	Ea	\$1,232.60
449	Irrigation Water Management	Advanced IWM >= 30 acres	Ac	\$48.27
449	Irrigation Water Management	IWM with Soil Moisture Sensors	Ea	\$1,010.20
449	Irrigation Water Management	IWM with Soil Moisture Sensors with Data Recorder	Ea	\$1,473.62
449	Irrigation Water Management	IWM with Irrigation Evaluation	Ea	\$2,852.43
449	Irrigation Water Management	IWM with Weather Station	Ea	\$2,619.17
533	Pumping Plant	Electric-Powered Pump ≤ 3 Hp	HP	\$939.73
533	Pumping Plant	Electric-Powered Pump ≤ 3 HP with Pressure Tank	HP	\$1,241.11
533	Pumping Plant	Electric-Powered Pump >3 to 10 HP	HP	\$312.63

533	Pumping Plant	Electric-Powered Pump >10 to 40 HP	HP	\$286.73
533	Pumping Plant	Electric-Powered Pump >40 HP, Centrifugal	HP	\$184.10
533	Pumping Plant	Variable Frequency Drive only (no pump) <=15Hp	Ea	\$2,904.46
533	Pumping Plant	Variable Frequency Drive only (no pump) >15 Hp	HP	\$168.92
533	Pumping Plant	Internal Combustion-Powered Pump ≤ 7½ HP	HP	\$450.97
533	Pumping Plant	Internal Combustion-Powered Pump > 7½ to 75 HP	HP	\$449.29
533	Pumping Plant	Internal Combustion-Powered Pump > 75 HP	HP	\$272.74
533	Pumping Plant	Windmill-Powered Pump	Ft	\$690.70
533	Pumping Plant	Solar, <1 Hp	Ea	\$4,884.58
533	Pumping Plant	Solar, 1-3 Hp	Ea	\$9,246.91
533	Pumping Plant	Solar, >3 Hp	Ea	\$15,018.51
533	Pumping Plant	Water Ram Pump	In	\$695.67
533	Pumping Plant	Livestock Nose Pump	Ea	\$807.61
533	Pumping Plant	Vertical Turbine Pump and drive, <100 Hp	HP	\$372.75
533	Pumping Plant	Vertical Turbine Pump and drive, >100 Hp	HP	\$292.53
533	Pumping Plant	Piston, manure	Ea	\$13,529.72
533	Pumping Plant	Vertical manure pump, PTO	Ea	\$9,151.82
533	Pumping Plant	Chopper manure pump	Ea	\$1,388.93
533	Pumping Plant	Turbine, Pump Only	HP	\$130.57