

CLIMATE FORWARD ▶

Solar Photovoltaic Forecast Methodology

Public Comment Webinar

June 27, 2019

Program Overview

The Solar Photovoltaic Forecast Methodology

1. Introduction
2. The GHG Reduction Project
3. Eligibility Rules
4. The GHG Assessment Boundary
5. Quantifying GHG Emission Reductions
6. Project Implementation Report
7. Reporting and Record Keeping
8. Confirmation Guidance

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PROGRAM OVERVIEW



Invest now in emissions reduction projects to mitigate future emissions

- **Credits recognized today to address future impacts**



Expands the scope and scale of feasible climate action across the economy

- **Enormous potential for diverse, creative climate solutions**



Issues Forecasted Mitigation Units (FMU) to projects that follow Reserve-approved methodologies

- **1 FMU = one metric ton of anticipated CO₂e reduction, to counter anticipated GHG emissions**



Tracks FMUs and project activities in a publicly accessible database

- **A registry of forward-looking GHG reductions to balance against forward-looking GHG impacts**

Who Should Use Climate Forward?

Companies and organizations mitigating future emissions

- Any new investment creating additional GHGs
- Not appropriate for addressing current emissions in a compliance program
 - e.g., cap-and-trade
- Not appropriate for mitigating historical emissions
- Companies seeking CEQA compliance

Examples of future mitigation needs

- New manufacturing facility
- New transportation projects
- New data center
- New retail complex
- New residential/commercial developments
- Future needs from current investments

Why Forward Crediting?

A new paradigm, reducing barriers to entry for innovative, targeted climate solutions that can also achieve sustainability goals beyond climate impacts

- Customized climate projects with specific **co-benefits** tailored to align with organizational goals and values
- **Local** projects in communities directly affected by operations
- New opportunities: demonstrate climate **leadership**

THE SOLAR PHOTOVOLTAIC FORECAST METHODOLOGY

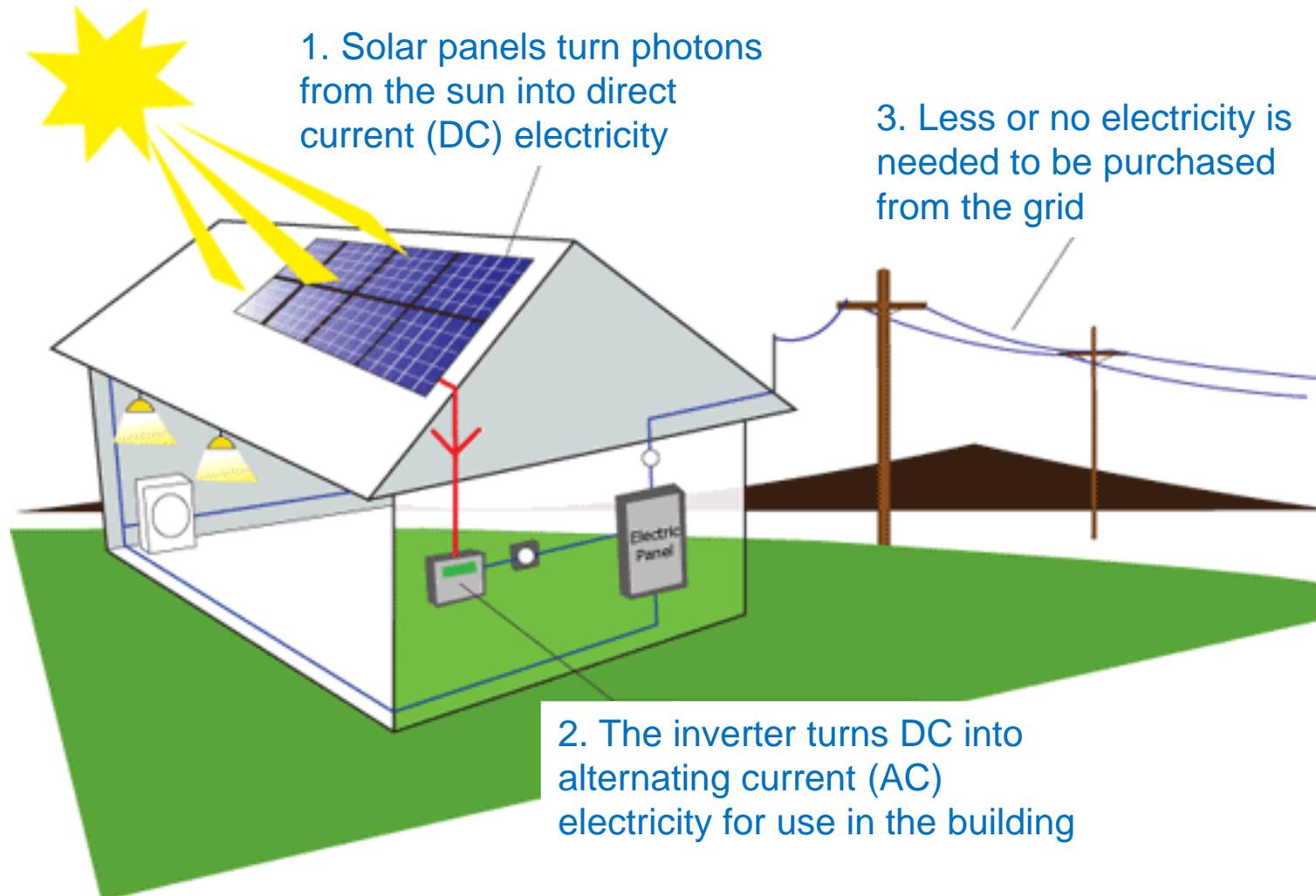
1. Methodology Introduction

Solar Photovoltaic Forecast Methodology accounts for GHG emission reductions associated with the installation of solar photovoltaic (PV) systems at existing buildings that will **produce electricity for use on site, avoiding electricity consumption from the electrical grid**

Methodology provides: eligibility rules, methods to calculate expected reductions, performance-monitoring instructions, and reporting procedures

Projects receive **independent confirmation** by a Reserve-approved *Confirmation Body* selected by the *Project Proponent*

FMUs are awarded on an **ex ante** basis following the application of this methodology and confirmation of project implementation



Section 2

THE GHG REDUCTION PROJECT

2.1 Project Definition

Retrofitting an existing building(s) with solar PV panels for on-site electricity use, avoiding grid electricity

1. Buildings must be operational at the time of proposal (i.e., no new buildings)
2. Solar PV systems must be new installations (i.e., no existing PV systems)
3. Solar PV systems, components, and installation parameters must fit within the constraints of the quantification model, PVWatts® Calculator
4. Systems may be roof- or ground-mounted
5. Projects must meet all other eligibility criteria detailed in Section 3

A project will typically involve the installation of a **batch** of eligible solar panels at multiple buildings. The entire batch shall constitute one “project”

Example: pilot project involves a batch of 24 PV systems installed on residential rooftops in disadvantaged communities in South Los Angeles

2.2 Project Proponent

An entity that has an active account on the Climate Forward registry, submits a project for listing and registration with the Reserve, and is ultimately responsible for all project reporting and confirmation

Required Attestations:

- Attestation of Title
- Attestation of Legal Additionality
- Attestation of Regulatory Compliance

2.3 Project Parameters

External **parameters document** containing the following:

- Eligible solar PV **systems, components,** and **installation parameters** based on the constraints of the calculation model PVWatts®
- Eligible **regions** based on additionality assessments
- Reserve-approved **quantification** and **monitoring** parameters

Additions or changes may be proposed and justified by the Project Proponent

All parameters must be approved by the Reserve prior to project listing

Section 3

ELIGIBILITY RULES

3. Eligibility Rules

I

LOCATION

- Regions able to be modeled with PVWatts®

II

START DATE and CREDITING PERIOD

- Submit for listing within one year of active electricity generation; confirm within two
- Crediting period defined by project-specific useful lifetime(s) of the PV system(s)

III

ADDITIONALITY

- Meet performance standard
- Exceed regulatory requirements

IV

ENVIRONMENTAL and SOCIAL SAFEGUARDS

- Must not cause negative environmental and social impacts
- Optional, voluntary reporting on non-GHG environmental and social benefits

3. Eligibility Rules (cont'd)

V

REGULATORY COMPLIANCE

- Compliance with all applicable laws

VI

OWNERSHIP and DOUBLE COUNTING

- No credits from other programs where GHG accounting boundaries overlap

VII

PROJECT RESILIENCE MEASURES

- Must address risks of failure and non-performance

VIII

MARKET EXPANSION OBJECTIVE

- Must expand opportunities for GHG mitigation

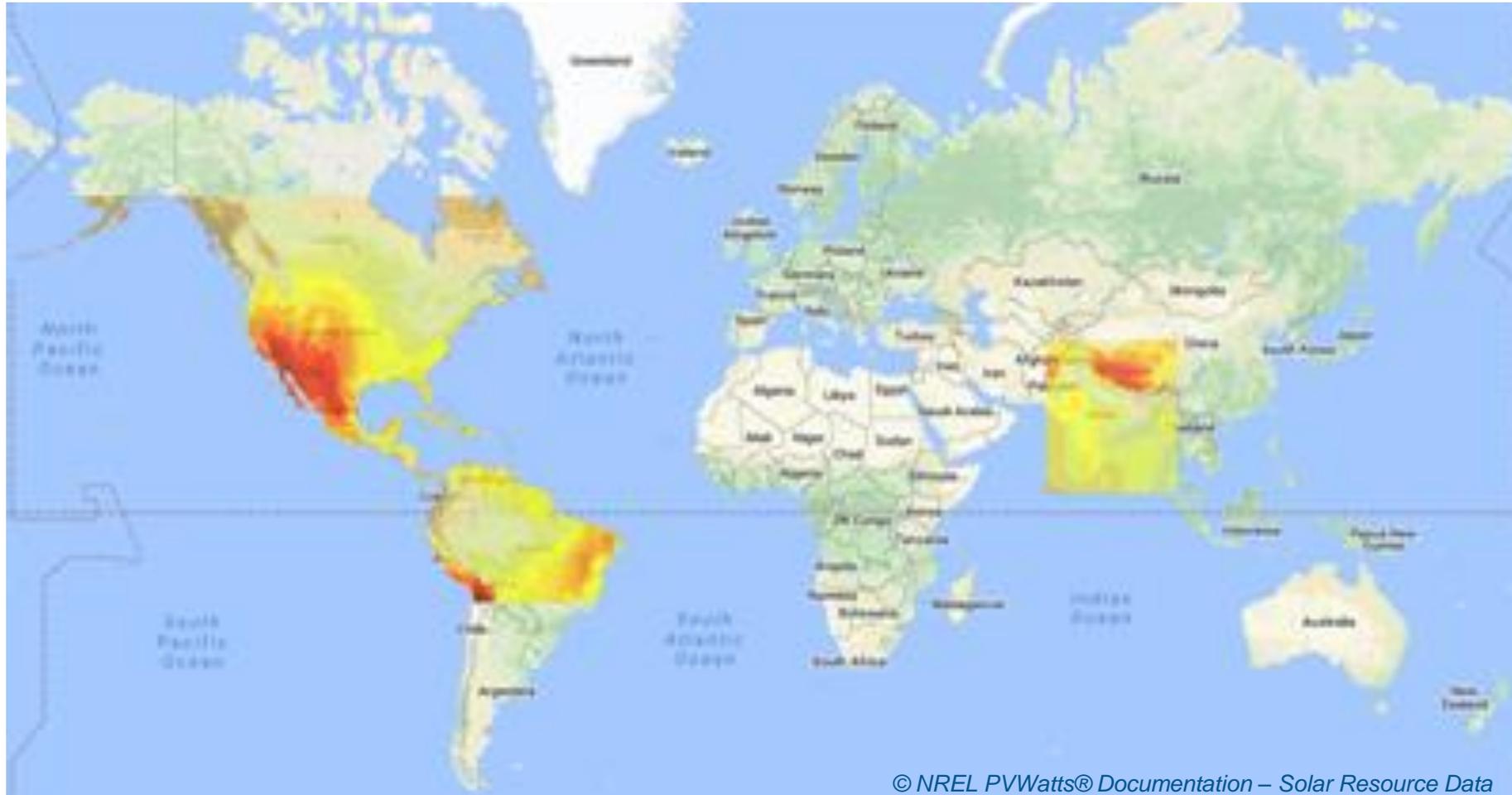
IX

DEMONSTRATION of *EX ANTE* SUITABILITY

- Must be suitable for *ex ante* crediting

3.1 Location

Must be located in a region able to be modeled by the PVWatts® Calculator



3.2 Project Start Date

The **date of initial operation and active generation** of grid-connected solar electricity at the building for each installation site

- May be different from the date of equipment installation
- Evidence of the date the solar PV installation became operational must be provided
- The earliest date of initial operation and active generation of electricity across all installation sites in a batch
 - To be included in a project, a system must be delivering electricity prior to confirmation

Projects must be **submitted** no more than **one year** after the project start date

Confirmation must be completed within **two years** after the project start date

3.2 Crediting Period

The length of time over which emission reductions are quantified and forecast:

The lifetime of the PV system, documented on a case-by-case basis

- Generally dictated by operations & maintenance (O&M) contracts & warranties
- Each site in a batch may have its own crediting period based on the individual systems

Proposed upon project submittal and established upon successful confirmation

Project proponents must also provide confirmable evidence that O&M will be undertaken to maintain the solar PV panels for the duration of the CP

3.3 Additionality

Must yield surplus GHG emission reductions “additional” to what would have occurred in the absence of the project

1. The Performance Standard Test

- Must not be common practice in the project region
- Supporting documentation includes surveys of market penetration rates, analyses of other incentives, and assessments of barriers to implementation

2. The Legal Requirement Test

- Must not be required by federal, state, or local regulations, or other legally binding mandates in the project region
- Project Proponent must perform review of existing and pending regulations to identify any specific “solar PV requirements” and provide evidence to Reserve and Confirmation Body

Applied at the project start date and held for duration of the crediting period

3.6 Ownership & Double Counting

Evidence of **transfer of rights of all emission reductions** to the Project Proponent is required and must be confirmed by the Confirmation Body

- Project Proponent must provide a signed Attestation of Title document and any necessary supporting evidence for each project
 - Must attest they have **exclusive claim** to the project's GHG reductions
 - Must attest that no other entities are reporting or claiming the project's GHG reductions
- Confirmation bodies must review relevant contracts, agreements, and/or supporting documentation between project proponents, end users, utilities, and other parties that may have a claim to the FMUs generated by the project

Projects must not generate and hold or sell Renewable Energy Credits (RECs)

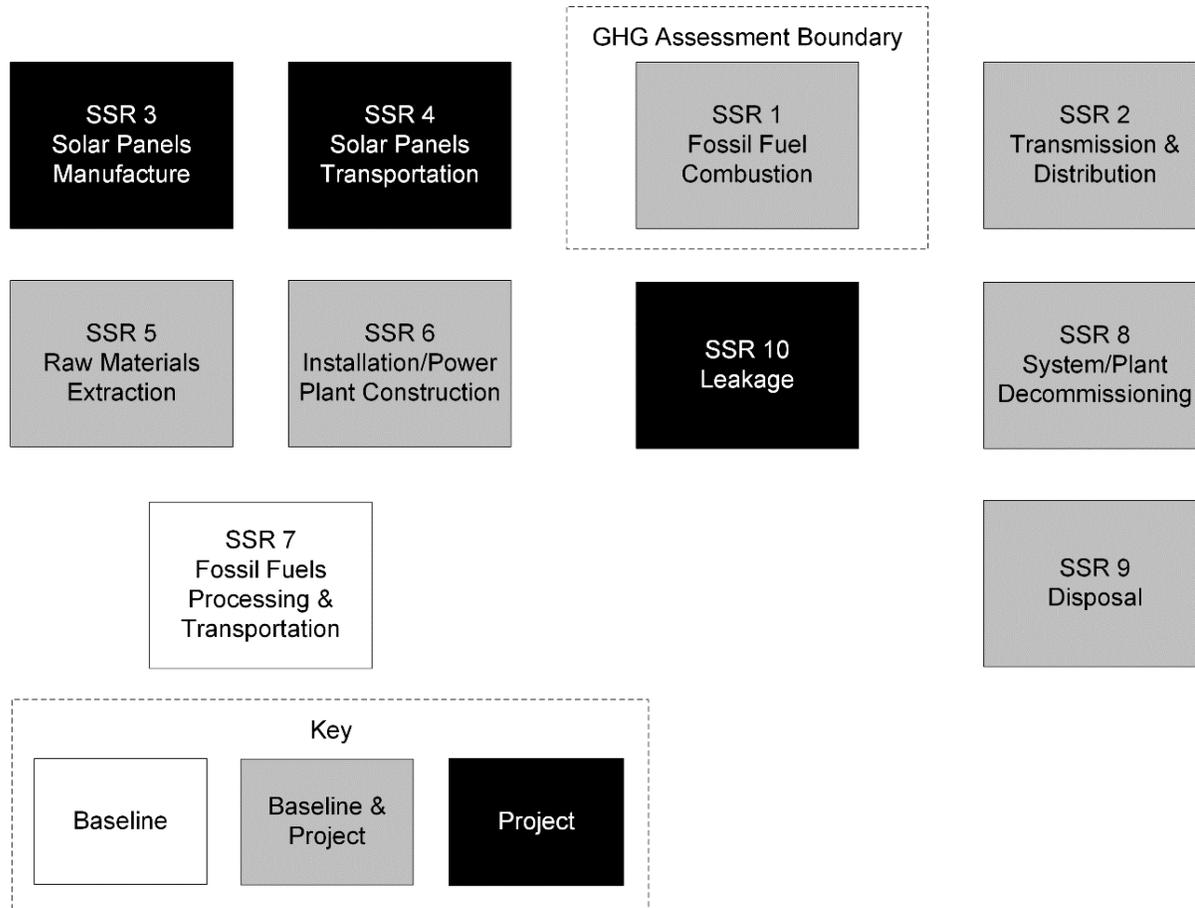
3.7 Project Resilience Measures

- Evidence of operational activity (Section 3.2)
- Operations & maintenance (O&M) contracts & warranty periods (Section 3.2)
- Measures to avoid potential future regulatory noncompliance (Section 3.5)
- Estimating solar PV performance decline (Section 5.4)
- Evidence of continued implementation (Section 8.3.4)
- **Energy services contracts with solar PV performance guarantees**
- **Long-term service contracts for continued system monitoring and maintenance and periodic inspections**
- **Evidence that the building itself will continue to be occupied for the lifetime of the system(s) (*optional*)**

Section 4

THE GHG ASSESSMENT BOUNDARY

4. The GHG Assessment Boundary



The GHG sources, sinks, and reservoirs (SSRs) to be assessed and confirmed to determine net change in emissions caused by installing solar PV panels

After construction and installation, solar PV panels are zero emission devices

The only SSRs included are displaced CO₂ emissions from local utility's combustion of fossil fuels

Section 5

QUANTIFYING GHG EMISSION REDUCTIONS

5. Quantifying GHG Emission Reductions (overview)

Compare modeled project emissions to modeled baseline emissions, forecasted forward throughout the crediting period

- **Baseline:** continued operations at a building, using grid electricity
 - Emissions from the amount of electricity that would have been purchased from the grid
 - Equal to the electricity generated by individual solar PV systems (as calculated by PVWatts®) multiplied by the local grid GHG emission factor
- **Project:** installation of a solar PV system and use of on-site solar energy to meet future power needs
 - The amount of solar energy generated by the PV system, which displaces the amount purchased from the local utility in the baseline, is a zero-emissions source of energy
 - Emissions are *zero*
- **Emission Reductions = Baseline Emissions**

5.1.1 Emission Factor Selection

Emission factors (EFs) represent the annual tCO₂e released to the atmosphere per unit of electricity generated for a given region

- Depend on the project's location, scale, and data availability
- Determined and approved prior to Listing based on supporting documentation submitted to the Reserve
- Preference is given to EFs with greater geographic-specificity
- **Marginal emission factors (MEFs)** must be used whenever feasible

Must also provide a method for how to **forecast changes** to the annual EFs going forward for each year of the project crediting period

- E.g., using regional annual energy outlook reports or renewable electricity mandates
- Assumes the replaced grid electricity will become less carbon-intensive over time

5.3 Estimating Solar PV Power Generation

PVWatts® Calculator is used to estimate the annual solar electricity generation for each system in the project

- Must be run independently for each year of the crediting period, making adjustments where required (e.g., performance decline)
- Requires six basic and three advanced inputs:
 - **BASIC**
 1. DC system size (kW)
 2. Module type
 3. Array type
 4. System losses
 5. Array tilt angle
 6. Array azimuth angle
 - **ADVANCED**
 1. DC to AC size ratio
 2. Inverter efficiency
 3. Ground coverage ratio

5.4 Estimating Performance Decline

Adjustments to two of the System Loss categories in the PVWatts® Calculator are required for each installation for each year of the crediting period as follows:

- 1. Light-induced degradation (LID):** phenomenon in which the power output of a module decreases when it is exposed to sunlight for the first time
 - The LID must be 1.5% in year 1 of the project's crediting period and adjusted to 0.5% in all subsequent years
- 2. Age:** Effect of weathering of the PV modules on the array's performance over time
 - Age must be 0% in year 1 of the project's crediting period and increased by 0.5% per year based on the age, starting at 1.5% in year 2

– Example:

Year 1	Year 2	Year 3	Year 4	Year 5
0%	1.5%	2%	2.5%	3%

Section 6

PROJECT IMPLEMENTATION REPORT

6. Project Implementation Report

Must be established for all project monitoring and reporting activities, specifying how data for all relevant parameters will be collected and recorded

Serves as the basis for the confirmation body to confirm monitoring and reporting requirements have been met

Project Implementation Report:

- PVWatts® inputs and outputs for each installation site
- Documentation to justify EFs, including their projections to future years
- ER calculations
- Historical electricity data
- Evidence of completed installation and date of operational activity commenced
- Evidence of operational activity
- Plans for O&M
- Warranties and/or maintenance contracts

Section 7

REPORTING AND RECORD KEEPING

7.1 Project Submittal Documentation

Required documentation:

LISTING:

- Project Submission form
- Prior approval for parameters to be used

CONFIRMATION:

- Signed Attestation of Title, Legal Additionality and Regulatory Compliance forms
- Project Implementation Report (not public)
- Confirmation Report and Confirmation Statement
- Confirmation List of Findings, Confirmation Plan and Sampling Plan (not public)

7.3 Reporting and Confirmation Period

Forecasted GHG reductions from the project are reported for the entire crediting period

Confirmation Period: period of time over which forecasted GHG reductions are confirmed

- Confirmation activities cannot commence until the project is Listed and the **PV systems have been operational for at least one year**
- Confirmation must conclude, and a Confirmation Statement must be issued, **no later than two years after the project start date**
- Successful confirmation fixes the start and end dates of the project crediting period for the duration of the mitigation project

7.4 *Ex post* Verification

OPTIONAL verification at the conclusion of the crediting period for *ex post* issuance of additional FMUs

Requirements:

- Data from each year of the crediting period **reflecting actual solar PV electricity production**, submitted in a Project Monitoring Report
- **Site visit** at the conclusion of the crediting period

At this time the methodology does not prescribe detailed *ex post* verification procedures; **guidance must be sought from the Reserve prior to** commencement of any *ex post* verification

Section 8

CONFIRMATION GUIDANCE

8. Confirmation Guidance

Confirmation guidance supplements the Program Manual and Confirmation Manual and describes confirmation activities specifically related to solar PV projects listed or registered under this methodology

Confirmation Bodies trained to confirm solar PV projects must be familiar with the following:

- Climate Forward Program Manual
- Climate Forward Confirmation Manual
- Solar Photovoltaic Forecast Methodology
- Solar Photovoltaic Forecast Methodology Parameters Document

8.1 Standard of Confirmation

Accredited confirmation body must confirm project has been implemented as described in the forecast methodology, **and that estimated emission reductions have been calculated accurately**

The Confirmation Body also confirms appropriate provisions have been undertaken to ensure the continued implementation of the project the duration of the crediting period

Both a **desktop review and a site visit** are necessary

Confirmation activities may commence one year after the PV system(s) have become operational

8.2 Confirming the Project Implementation Report

The Project Implementation Report serves as the basis for confirmation bodies to confirm that monitoring and reporting requirements have been met

Confirmation Bodies must do the following:

- Assess the compliance of the Project Implementation Report with the requirements of the methodology, Climate Forward Program Manual, and the Climate Forward Confirmation Manual
- Confirm that the Project Implementation Report includes all necessary parameters
- Assess the means of implementation of the project data capture, including data management and quality assurance and quality control procedures, and determine whether these are sufficient to ensure the accuracy of forecasted emission reductions

8.3 Core Confirmation Activities

Core confirmation activities incorporate both a desktop documentation review and site visit assessment of the mitigation project as follows:

1. Reviewing GHG management systems and estimation methodologies

- Review and assess the appropriateness of the methodologies and management systems that the Project Proponent uses to gather data and calculate baseline and project emissions

2. Confirming emission reduction estimates

- Investigate areas that have the greatest potential for material misstatements and then confirm whether material misstatements have occurred
- Recalculate a representative sample for comparison with data reported by the Project Proponent in order to confirm the GHG emission reduction calculations

8.3 Core Confirmation Activities (cont'd)

3. Undertaking site visits

- At a minimum, the Confirmation Body must visit a random sample of 25% of all installation sites in the project
- During field site visits, at a minimum the Confirmation Body will:
 - Inspect the installation sites to establish whether reported existence and use of PV systems is as recorded in the Project Implementation Report
 - Review and discuss with the Project Proponent evidence of project resilience measures and of continued implementation

4. Confirming evidence of project resilience measures and continued implementation

- Confirmation site visit will include assessment of implementation of required measures and review of relevant documentation (e.g., warranties, contracts, etc.)

QUESTIONS?

Contact Information

Trevor Anderson

Policy Manager

(213) 891-6927

tanderson@climateactionreserve.org

Robert Lee

Program Director

(213) 785-1230

rzlee@climateactionreserve.org



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