California Public Utilities Commission Multifamily Affordable Solar Housing Program Handbook First Edition

Center for Sustainable Energy®

Pacific Gas and Electric Company®

SDGE A Sempra Energy utility®

SOUTHERN CALIFORNIA EDISON® An EDISON INTERNATIONAL® Company

The California Public Utilities Commission (CPUC) prohibits discrimination in employment, its regulatory programs, and activities on the basis of race, national origin, color, creed, religion, sex, age, disability, veteran status, sexual orientation, gender identity, or associational preference. The CPUC also affirms its commitment to providing equal opportunities and equal access to CPUC regulated facilities and programs. For additional information or to file a complaint, contact the State Personnel Board, Office of Civil Rights, Discrimination Complaint Monitoring and Analysis, Kristen Trimarche (916) 653-1621.

Table of Contents

1. Introduction: California Solar Initiative Program 4
    1.1 Program Overview 4
    1.2 Getting Started with Solar 9
    1.3 MASH Handbook Structure 9
    1.4 MASH Program Administrator Contact Information and Other Useful Resources 10
Program Section 13
2. Program Eligibility Criteria and Requirements 14
    2.1 MASH Program Participants 14
    2.2 Generation System Equipment Eligibility 19
    2.3 Energy-Efficiency Requirements 22
    2.4 Energy Saving Assistance (ESA) Program Requirements 23
    2.5 Job Training Requirements 23
    2.6 Affidavit Ensuring 50% Tenant Economic Benefit 25
    2.7 Warranty Requirements 26
    2.8 Performance and Permanency Requirements 26
    2.9 Interconnection to the Electric Utility Distribution System 27
    2.10 Metering Requirements 28
    2.11 Inspection Requirements 28
    2.12 Measurement and Evaluation Requirements 29
    2.13 MASH Program Database Requirements 29
    2.14 Additional Requirements and Terms 30
3. Multifamily Affordable Solar Housing Incentive Structure 31
    3.1 Expected Performance Based Buydown (EPBB) Incentives 31
    3.2 Incentive Limitations 33
    3.3 Other Incentives or Rebates 35
    3.4 Right to Audit Final Project Costs and Affidavits 35
    3.5 Site and Host Customer Limitations 36

Table of Contents

3.6 Limitations on Installed Cost 36

4. Application Process for MASH Projects....38

4.1 Application Process for MASH Projects 38

4.2 Application Forms and Documentation 44

4.3 Changes to Reservations....52

4.4 Incentive Payment Process 54

4.5 System Changes Affecting Incentive Amount 55

4.6 MASH Project Review 56

4.7 Notifications, Sanctions and Dispute Resolution 59

4.8 Expended Budget Guidelines 61

Technical Section....64

5. Metering Requirements....65

5.1 EPBB Metering Requirements 65

5.2 Minimum Metering Equipment Requirements 66

5.3 Minimum Communication Requirements 67

5.4 Minimum Performance Monitoring & Reporting Capability Requirements 67

5.5 Advanced Metering Infrastructure (AMI) Coordination 68

5.6 MASH Program Administrator Liability 68

6. Equipment Certification, Rating Criteria & Design Factor Calculations 69

6.1 Equipment Certifications and Rating Criteria....69

6.2 Design Factor Calculation: Expected Performance Based Buydown (EPBB) Incentive 69

7. Field Verification 72

8. Surface Orientation Factors for California Locations 73

9. Acronyms....74

Appendices....77

Appendix A: Definitions 78

Table of Contents

Appendix B: Additional Requirements and Terms 90
Appendix C: Inverter Integral 5% Meter Performance Specification and Test Requirements 94
Appendix D: Cover Sheet for Public Utilities Code Section 2852 Documentation 130
Appendix E: Affidavit Ensuring 50% Tenant Economic Benefit 133
Appendix F: Job Training Affidavit 135
Appendix G: ESA Information Notice for Tenants 144

1. Introduction: California Solar Initiative Program

1.1 Program Overview

The Multifamily Affordable Solar Housing (MASH) Program is overseen by the California Public Utilities Commission (CPUC or Commission) and provides incentives to qualifying affordable housing within the service territories of Pacific Gas & Electric Company (PG&E), Southern California Edison Company (SCE), and San Diego Gas & Electric (SDG&E).

In Decision (D.) 06-01-024, the CPUC collaborated with the California Energy Commission (CEC) to establish the California Solar Initiative (CSI) and the New Solar Homes Program (NSHP) to fund rebates for installation of qualifying solar energy systems for customers of PG&E, SCE), and SDG&E[1]. In that decision, the Commission committed ratepayer funds of $2.5 billion over a 10-year period for solar incentives and required that 10% of the funds be used for projects for low-income residential customers and affordable housing projects. In March 2006, the Commission opened a new proceeding, Rulemaking 06-03-004, to handle the implementation details of CSI, including establishing a low-income and affordable housing incentive program. In August 2006, the Commission adopted D.06-08-028 containing implementation details for the general market portion of CSI, while details surrounding incentives to low-income and affordable housing were set for consideration in Phase II of the proceeding. At the same time, the Governor signed Senate Bill (SB) 1[2], containing a modified budget and other directives to the Commission regarding CSI and NSHP. In response to SB 1, the Commission issued another decision in December 2006 modifying CSI[3]. This decision, D.06-12-033, adopted a 10-year total CSI budget of $2.1668 billion and a low-income incentive budget of $216.68 million.[4] [5]

Also in 2006, the Legislature passed Assembly Bill (AB) 2723[6] requiring the Commission to ensure that not less than 10% of overall CSI funds be used for installation of solar energy systems on “low-income residential housing,” as defined in the bill.

In designing a low-income and affordable housing solar incentive program, the Commission adopted a program for qualifying low-income single family homeowners separately from a program for multifamily affordable housing. In November 2007, the Commission issued D.07-11-045, which established a $108 million SASH incentive program for low-income homeowners to provide subsidies for solar energy systems on existing owner-occupied low-income households. In October 2008, the Commission issued D.08-10-036, which established a $108 million MASH incentive program for qualifying affordable housing developments, as defined in state law.

[1] CSI is overseen by the CPUC and targets solar facilities on existing homes and new and existing businesses. NSHP is overseen by the CEC and targets solar installations in the new home construction market, including solar on newly constructed low-income housing.
[2] Statutes of 2006, Chapter 132
[3] See D.06-12-033
[4] ID. At 28
[5] D.11-12-019, adopted on December 1, 2011, increased the CSI budget by an additional $200 million.
[6] Statutes of 2006, Chapter 864

In 2013, the Legislature passed AB 217 (Bradford),[7] which authorizes $108 million in new funding for MASH and SASH, sets a goal of 50 megawatts (MW) of installed capacity across both programs, and extends the programs until 2021, or the exhaustion of the new funding, whichever occurs first. AB 217 also sets the following new policy goals:

- Maximize the overall benefit to ratepayers;
- Require participants who receive monetary incentives to enroll in the Energy Savings Assistance (ESA) program, if eligible; and
- Provide job training and employment opportunities in the solar energy and energy efficiency sectors of the economy.

This MASH Program Handbook describes the detailed requirements for receiving funding for the installation of solar energy system projects under this program.

1.1.1 MASH Program Budget

Pursuant to AB 217, Decision (D.) 15-01-027 establishes a $54 million solar incentive program for MASH and a $54 million solar incentive program for SASH. MASH and SASH will provide solar incentives to qualifying affordable housing, as defined in state law. The MASH budget as authorized by the CPUC for each Program Administrator is shown in Table 1 and Table 2. To ensure that there is sufficient incentive funding for the program to reach its capacity goal, Track 1D incentives are capped at 80% of the total incentive funding.

The MASH Program will be offered until the Program Administrator territory MW targets have been reached or until the allocated incentive budget for each Program Administrator territory has been spent, whichever occurs first. It is also important to note that once the Track 1D 80% incentive budget cap is met per Program Administrator service territory, all other reservations will be limited to Track 1C incentive funding. MASH projects will not receive a reservation if funding is not available and will be placed on a waitlist.

Once the incentive budget becomes fully subscribed within each Program Administrator territory, the incentive amount per application will be capped at the reserved amount in Step 1 (Reservation Request step). System modifications resulting in an increase in the incentive amount during the Proof of Project Milestone (PPM) or Incentive Claim Form (ICF) step will not be paid.

Conversely, if the system modification results in a decrease in the incentive amount during the ICF step, the lower of the PPM confirmed reservation amount and the revised incentive will be paid.

[7] Statutes of 2013, Chapter 609

Table 1
MASH Total Program Budget by Program Administrator [8]

Program Administrator	% of Total Budget	Budget (in millions)
PG&E	43.7%	$ 23,598,000
SCE	46.0%	$ 24,840,000
CSE[9]/SDG&E	10.3%	$ 5,562,000
Total	**100%**	**$ 54,000,000**

Table 2
MASH Allocation by Budget Category

MASH Budget Category	MASH Budget Allocation
Incentives	$50,220,000 (93%)
Administration, Marketing, Evaluation	$3,240,000 (6%) $540,000 (1% evaluation reserve)
Total	**$54,000,000**

1.1.2 MW Targets

The adopted capacity target for MASH will be 35 MW. In order to guarantee that there is sufficient incentive funding for the program to reach its 35 MW capacity goal, Track 1D incentives may utilize no more the 80% of the total incentive funding. Once the 80% incentive budget cap has been met for Track 1D per Program Administrator territory, all other reservations will be limited to Track 1C incentive levels.

1.1.3 Incentive Structure

MASH provides fixed, up front, capacity-based incentives for qualifying solar energy systems, using the Expected Performance Based Buydown (EPBB) methodology. There are no Performance Based Incentive (PBI) payments under this program The EPBB incentives are paid based on verified solar energy system characteristics such as location, system size, shading, and orientation. The amount of the EPBB incentive depends on which Track (1C or 1D) the applicant is applying. Table 3 below outlines MASH incentive levels.

[8] Administrative and incentive budget surpluses from the original MASH budget that was established through Senate Bill 1 will be rolled over the new MASH Program's incentive budget. The above budget does not reflect the rollover budget surplus.

[9] CSE is the Program Administrator in SDG&E service territory.

Table 3
MASH EPBB Incentive Rate by Track

Track	Incentive Rate per Watt	Eligibility Requirements

1C: PV System Offsetting Common Area Load, Non-VNM Tenant Load, or VNM Tenant Load with <50% Tenant Benefit	$ 1.10	• Provide job training opportunity to more than one trainee, with one additional trainee for each 10 kW up to 50 kW
		• Conduct onsite walkthrough energy audit at ASHRAE Level I or higher, or enroll in a utility, REN, CCA or federally provided whole-building multifamily energy efficiency program
		• Portion of system allocated to offsetting one of the following:
		  ○ Common Area Load
		  ○ Non-VNM Tenant Load
		  ○ VNM Tenant Load where tenant receives less than 50% of economic benefit of allocated generation

1D: PV System Offsetting VNM Tenant Load with ≥ 50% Tenant Benefit	$1.80	• Provide job training opportunity to more than one trainee, with one additional trainee for each 10 kW up to 50 kW • Conduct onsite walkthrough energy audit at ASHRAE Level I or higher, or enroll in a utility, REN, CCA or federally provided whole-building multifamily energy efficiency program • Portion of PV system allocated to offsetting: ○ VNM Tenant Load where tenant receives at least 50% of economic benefit of allocated generation

1.1.4 Special Funding for Low Income Programs

1. The CPUC has allocated 10 percent of the overall CSI Program budget, or $216 million, to incentives for affordable housing/low-income residents. This amount is divided equally between two programs, one for single-family residences (SASH) and one for multifamily residences (MASH). The CPUC adopted the framework for the SASH Program in Commission Decision (D.) 07-11-045, and for the MASH in D.08-10-036.
2. On January 30, 2015, the CPUC adopted (D.) 15-01-027 pursuant to Assembly Bill 217 which established additional funding of $54 million for the MASH program.
3. The MASH Program offers incentives for solar energy system installations on existing multifamily affordable housing that meets the definition of low-income residential housing established in Pub. Util. Code § 2852.a.2. There were two tracks originally offered in the MASH program. Track 1 and Track 2. As a result of the higher demand of the Track 1 incentive program, D.11-07-031 reallocated all unreserved Track 2 incentive budget to Track 1 and closed the Track 2 program
4. Track 1 is designed to provide fixed, up front, capacity-based EPBB incentives. It offered two incentive levels, Track 1A for systems that offsets common area load and Track 1B for systems that offsets tenant load. D.11-07-031 reduced the Track 1 incentive levels for any new MASH Reservation Requests that are reviewed after July 14, 2011.
5. D.15-01-027 adopted new incentive levels under Track 1C and Track 1D and retained the core design of fixed, up front and capacity-based EPBB incentives. Track 1C is for systems that offset common area load, non-virtual net metering tenant load or virtual net metering (VNM) tenant load with <50% tenant benefit. Track 1D is for systems that offset VNM tenant load with ≥50% tenant benefit.
6. Sites that choose to install one solar electric system per tenant unit instead of a VNM arrangement are eligible for 1D incentive funding (provided that all other program requirements are met).
7. See Table 3 for Track 1C and 1D incentive levels.

1.2 Getting Started with Solar

To find out how to get started with solar, please visit you Program Administrator's website for more information.

CSE: www.energycenter.org

SCE: www.sce.com/MASH

PG&E: www.pge.com/solar

1.3 MASH Handbook Structure

Following this introduction, the MASH Program Handbook is divided into two primary sections: Program and Technical. The Program Section includes the less technical information about the MASH Program, including descriptions of eligibility and participation, incentive structure and application processes. As its name implies, the Technical Section includes more technical Program information, such as metering requirements, formulas for incentive and system rating calculations, surface orientation factors and PTC ratings. Appendices of acronym and term definitions follow these Sections. This structure is intended to make the Handbook more useful and accessible.

The MASH Handbook provides information and guidelines for the Multifamily Affordable Solar Housing Program. For information on the CSI General Market program, please refer to the CSI Handbook.

1.4 MASH Program Administrator Contact Information and Other Useful Resources

Program Administrators	
Pacific Gas and Electric Company (PG&E) Telephone: Solar Customer Service Center: (877) 743-4112 Fax: (415) 973-2510 Mailing Address: PG&E Solar and Customer Generation (MASH) P.O. Box 7433 San Francisco, CA 94120-7433 Overnight Mail: 245 Market St Mail Code: N7R San Francisco, CA 94105-1797	www.pge.com/MASH PG&E offers solar classes: www.pge.com/solarclasses Email: solar@pge.com
Southern California Edison (SCE) Telephone: (866) 584-7436 Fax: (626) 302-6132 Mailing Address: Attn: MASH Program Administrator SCE Customer Solar & Self-Generation Southern California Edison P.O. Box 800 Rosemead, CA 91770-0800	www.sce.com/MASH Email: csigroup@sce.com
Center for Sustainable Energy (CSE) Telephone: (858) 244-1177 Fax: (858) 244-1178 Mailing Address: Attn: MASH Program 9325 Sky Park Ct., Suite 100 San Diego, CA 92123-1502	www.energycenter.org CSE solar events and classes www.energycenter.org/events Email: csi@energycenter.org
Utility Interconnection & NEM Contacts	
Pacific Gas and Electric Company (PG&E) Telephone: Solar Customer Service Center: (877) 743-4112	www.pge.com/gen Email: snemhelp@pge.com or rule21gen@pge.com

Southern California Edison (SCE) Telephone: (866) 600-6290 Mailing Address: CSI NEM Program Administrator SCE Customer Solar & Self-Generation Southern California Edison P.O. Box 800 Rosemead, California 91770-0800	Email: customer.generation@sce.com
San Diego Gas & Electric (SDG&E) Telephone: (858) 636-5585 Mailing Address: Net Metering Team San Diego Gas & Electric PO Box 129831, CP52F San Diego, CA 92123-9749 Telephone: (858) 636-5581 Mailing Address: Ken Parks San Diego Gas & Electric PO Box 129831, CP52F San Diego, CA 92123-9749	www.sdge.com/business/self_generation.shtml Email: netmetering@semprautilities.com Email: kparks@semprautilities.com
Other Useful Resources	
Go Solar California is the **CSI statewide consumer website** which includes information on the CPUC, CEC, and POU programs, including the CSI Program Handbook	www.GoSolarCalifornia.ca.gov
Information on upcoming **CSI Program Forums** and a sign-up form for the **CSI Newsletter** are available on the Go Solar California site.	http://www.gosolarcalifornia.ca.gov/news_media/newsletter/

The California Solar Initiative provides a **list of Solar Contractors** online	www.gosolarcalifornia.ca.gov/database/search-new.php
Verify that a Solar Contractor is using a valid contractor's license by contacting the **Contractors State License Board**	www.cslb.ca.gov
The MASH Program Administrators may use an online tool to calculate the up-front Expected Performance Based Buy down (EPBB) incentive, known as the **EPBB Calculator**	www.csi-epbb.com
The MASH Program Administrators use an online application tool and reporting database, known as **PowerClerk**	www.csi.powerclerk.com
Information about the **CPUC regulatory** proceeding that deals with the CSI Program	www.cpuc.ca.gov/PUC/energy/solar/
California Solar Statistics contains data information about the progress of the CSI program	www.CaliforniaSolarStatistics.ca.gov
PV system components must be certified by the California Energy Commission. **Lists of CEC-certified eligible equipment** are available on the Go Solar California site or through the CEC Call Center	www.gosolarcalifornia.org/equipment (800) 555-7794
The California Energy Commission's **New Solar Homes Partnership (NSHP) Program** site provides information on the program and how to participate	http://www.newsolarhomes.org/
Information on **federal tax credits** for solar installations can be found on the Go Solar California site	www.gosolarcalifornia.ca.gov/consumers/taxcredits.php

PROGRAM SECTION

2. Program Eligibility Criteria and Requirements

The MASH Program offers monetary incentives for eligible systems up to the first 1,000 kW (1 MW) CEC-AC[10] of generating capacity or displaced grid electric load. To qualify for incentives, all MASH Program eligibility criteria must be satisfied. The effective dates for the MASH Program as covered in this handbook start from the CPUC approved implementation date through December 31, 2021[11], or until the MASH Program budget has been fully reserved for each Program Administrator, whichever comes first.

2.1 MASH Program Participants

Any retail electric distribution customer of PG&E, SCE, or SDG&E is eligible to install a solar energy system project (Project) and receive incentives from the MASH Program. Eligible participants in the MASH Program must be current electric distribution customers of Program Administrator at the facility (Project Site) where the Project will be installed. Within the nomenclature of the MASH Program, the person who applies for an incentive is referred to as a Host Customer, a System Owner, and/or Applicant. Other participants include Solar Contractors and Equipment Sellers.

2.1.1 Applicant

The Applicant is the entity that completes and submits the MASH Program application and serves as the main contact person for the MASH Program Administrator throughout the application process. Host Customers may act as the Applicant or they may designate a third party to act as the Applicant on their behalf. Applicants may be third parties (i.e., a party other than the Program Administrator or the utility customer) such as, but not limited to, engineering firms, Solar Contractors, equipment distributors, energy service companies (ESCO) and equipment lessors.

2.1.2 Host Customer

Any retail electric distribution customer of PG&E, SCE or SDG&E is eligible to install a solar project and receive incentives from the MASH Program and, therefore, can be a Host Customer.

For MASH, the Host Customer may also be the owner of or persons/entity responsible for, the property where the generating equipment will be located. The Project Site must be within the service territory of, and receive retail level electric service[12] from, PG&E, SCE, or SDG&E. Municipal electric utility customers are not eligible to receive incentives from the designated Program Administrators.

10 California Energy Commission Alternating Current is PTC Rating x Number of Modules x Inverter Efficiency

11 The CSI Program, including MASH began on January 1, 2007 and AB 217 extended the MASH program through December 31, 2021, or until the MASH Program budget has been fully reserved for each Program Administrator, whichever comes first.

12 "…retail level electric service…" means that the Host Customer pays for and receives distribution services, as defined by their respective utility rate schedule.

The Host Customer is the incentive reservation holder. The Host Customer may act as the Applicant and/or System Owner. The Host Customer alone will retain sole rights to the incentive reservation and corresponding incentive reservation number. The Host Customer has the right to designate the Applicant, energy services provider, and/or Solar Contractor to act on their behalf. The Host Customer also has the right to change these parties at any given time with prior written notice to the Program Administrator. However, the Host Customer shall be party to the MASH Program contract.

The Host Customer or Applicant is encouraged to submit the MASH application as early as possible in the process in order to confirm the reservation amount. All Projects must meet all eligibility requirements in order to receive the MASH incentives.

2.1.3 System Owner

The System Owner is the owner of the generating equipment at the time the incentive is paid. For example, when a vendor sells a turnkey system to a Host Customer, the Host Customer is the System Owner. In the case of a third-party-owned system (or leased system, for example), the third party (or lessor) is the System Owner.

The System Owner should be designated on the Reservation Request Package, if known at that time, and on the Incentive Claim Form. If different from the Host Customer, the System Owner shall also be a party to the MASH Program contract. The Program Administrator may require documentation substantiating equipment ownership.

2.1.4 Solar Contractor

Except for those systems that are self-installed, all systems must be installed by appropriately licensed California contractors in accordance with rules and regulations adopted by the State of California Contractors State Licensing Board (CSLB). Solar installation contractors must have an active A, B, C-10, or a C-46 license for photovoltaic (PV) systems. Please see Section 2.7 for Warranty Requirements of Self-Installed systems and Section 4.2.4.2 for required documentation of Self-Installed systems.

Although not required, solar installation contractors are encouraged to become certified by the North American Board of Certified Energy Practitioners (NABCEP). For additional information on NABCEP, go to www.nabcep.org.

In all cases, systems must be installed in conformance with the manufacturers' specifications and with all applicable electrical and building codes and standards.

The Program Administrator will verify that the Solar Contractor has an active license with the California Contractors State Licensing Board (CSLB), in accordance with the above requirement, during application process review.

2.1.4.1 Suspended Solar Contractor License

If it is determined that a contractors' CSLB license was suspended during the application process or that the Solar Contractor has been suspended from the MASH Program, the following will occur:

- Reservations will not be confirmed and all applications associated with the contractor will be suspended;
- No MASH incentive payment will be made unless the system was interconnected prior to the suspension;
- All parties identified on the application will be notified of the suspension;
- If the system has not yet been installed, the Host Customer will be able to hire a new contractor without losing its current incentive reservation and apply for an extension, if necessary.
- Incentive payments will not be made to contractors whose license is expired or suspended.

If a suspended license occurs under a qualifying bond individual or responsible managing officer, as designated by the CSLB and has previously been suspended from the Program under a different company name, the new company will also be suspended from the Program.

If it is determined that an Applicant, System Owner, Seller, and/or Host Customer is suspended from the program, the Program Administrator will notify all parties involved in the application of the suspension. The Program Administrator will determine whether the project can be paid incentives or whether the project is ineligible to be paid incentives. If the project is deemed to be payable, the Program Administrator, in most cases, will only pay the Host Customer for the project.

2.1.5 General MASH Eligibility Guidelines

The following are generally used to determine MASH program eligibility:

- Residential - Multi-family low-income: All eligible Project sizes (1 kW – 1 MW incentivized, project can install up to 5 MW of generation); Retrofit projects only, no new construction
- Eligibility under Pub. Util. Code Section 2852 (a)(3) defines "low-income residential housing" as one of the following:
    - Multifamily residential complex financed with one or more of the following:
        - low-income housing tax credits
        - tax-exempt mortgage revenue bonds
        - general obligation bonds
        - local, state, or federal loans or grants

    AND for which either of the following applies:

        - the rents of the occupants who are lower income households do not exceed those prescribed by deed restrictions or regulatory agreements pursuant to the terms of the financing or financial assistance; or

        - the affordable units have been or will be initially sold at an affordable housing cost to a lower income household, and those units are subject to a resale restriction or equity sharing agreement pursuant to the terms of the financing or financial assistance

    - Multifamily residential complex in which at least 20% of the total housing units are sold or rented to lower income households AND either of the following applies:
        - The rental housing units targeted for lower income households are subject to a deed restriction or affordability covenant with a public entity or nonprofit housing provider organized under Section 501(c)(3) of the Internal Revenue Code that has as its stated purpose in its articles of incorporation on file with the office of the Secretary of State to provide affordable housing to lower income households that ensures that the units will be available at an affordable rent for a period of at least 30 years; or

        - The housing units have been or will be initially sold at an affordable cost to a lower income household, and those units are subject to a resale restriction or equity sharing agreement, for which the homeowner does not receive a greater share of equity than described in paragraph (2) of subdivision (c) of Section 65915 of the Government Code, with a public entity or nonprofit housing provider organized under Section 501(c)(3) of the Internal Revenue Code that has as its stated purpose in its articles of incorporation on file with the office of the Secretary of State to provide affordable housing to lower income households.

        - Documentation of CPUC Code 2852 must be independently enforceable and verifiable and cannot be contingent upon participation in the MASH program.

The following are ***not*** eligible for incentives under the MASH Program:

- Customers who have entered into utility contracts for distributed generation (DG) services (e.g., DG installed as a distribution upgrade or replacement deferral) and who are receiving payment for those services. This does not include third-party ownership arrangements, i.e., power purchase agreements, which are allowed.

- Customers who have entered into agreements that entail the export and sale of electricity from the Host Customer Site. This does not include net energy metering agreements, which are allowed.
- Customers who have received a final interconnection authorization letter more than 12 months prior to submitting a MASH Reservation Request Package.
- Publicly-owned or investor-owned gas, electricity distribution utilities or any electrical corporation (ref. Public Utility Code 218) that generates or purchases electricity or natural gas for wholesale or retail sales.
- Multifamily residential new construction systems are not eligible for the MASH Program and should apply to the California Energy Commission's New Solar Homes Partnership Program.

2.1.5.1 Eligibility for Applicants Participating Concurrently in the MASH Program and NEM Aggregation pursuant to a Utility NEM Tariff

The eligibility for applicants participating concurrently in the MASH Program and NEM Aggregation pursuant to a Utility NEM Tariff for an incentive based on the aggregated system will be based on current Reservation status in the MASH Program.

New applications: Any applicant participating in NEM Aggregation pursuant to a Utility NEM Tariff who have not yet submitted an application for a MASH incentive should submit the initial MASH reservation to reflect the aggregated system, and should supply physical address, account and meter information for all accounts (Generating and all Aggregated Accounts(s)) that are part of the NEM Aggregation arrangement, as filed with the Utility, not only in the application, but also on all supporting documents, including, but not limited to, the Reservation Request Form and Letter of Authorization to Receive Customer Information (if applicable). The Energy Efficiency requirement (see Section 2.3) should be completed for each physical address that is documented on the NEM Aggregation arrangement, as filed with the Utility. The PA may request additional documentation on a case by case basis.

Existing applications: Any application that has not yet reached *Reservation Reserved* status[13] will have the option to revise his/her reservation to reflect the aggregated system, except where limited by the respective utility territory's available incentive funding. The PA may request new MASH Program documentation and/or application fee(s) if the reservation is changed from the original submission.

Multiple solar electric systems that have multiple reservations in the MASH Program queue that have already reached *Confirmed* status, and/or any status prior to *Confirmed*[14] but not further[15], and are re-designed to form a single generating solar electric system that offsets

[13] Statuses prior to *Reservation Reserved* may include *Reservation Request Review; Suspended Reservation Request Review; Pending RFP.*
[14] Statuses prior to *Confirmed* may include *Reservation Request Review; Suspended Reservation Request Review; Pending RFP; Reservation Reserved.*
[15] Applicants are not eligible to revise the application to reflect an aggregated system or receive an incentive for an aggregated system if under of any of the following statuses: *Incentive Claim Request Review; Suspended Incentive*

aggregated loads and participates in NEM Aggregation may opt to combine the reservations into a single application, not to exceed the sum of the originally Reserved dollar amount(s). The PA may request new MASH Program documentation and/or application fee(s) if the reservation is changed from the original submission.

All reservation awards will be dependent upon the respective utility's available incentive funding.

2.2 Generation System Equipment Eligibility

Although solar PV systems (i.e., systems that cause direct conversion of sunlight to electricity) are expected to be the common technology to receive incentives from the MASH Program, the MASH Program also accepts applications for other solar electric generating technologies. Guidelines for other solar electric generating technologies (including estimation, measurement and metering) are included in this MASH Handbook.

Details of the eligibility requirements for generation system equipment follow.

2.2.1 New Equipment, Not Pilot or Demonstration Systems

All major system components (panels and inverters) must not have been previously placed in service in any other location or for any other application. Rebuilt, refurbished, or relocated equipment is not eligible to receive MASH incentives.

Components that are critical to the PV systems must have at least one year of documented commercial availability to be eligible. Commercially available means that the major solar energy system components are acquired through conventional procurement channels, installed and operational at a Project Site. Ineligible equipment includes field demonstrations for proof-of-concept operation of experimental and non-conventional systems partially or completely paid for by research and development funds. Pilot and Demonstration systems are ineligible for MASH incentives. Components that are enhancements to existing products and new models of existing product lines do not have to meet the commercial availability requirement as long as they are UL-certified and performance data exists to allow the Program Administrators to estimate their expected performance.

An alternative method of seeking eligibility for solar energy systems that use new technologies is to obtain certification from a nationally recognized testing laboratory indicating that the technology meets the safety and/or performance requirements of a nationally recognized standard. System component ratings must also be certified by the California Energy Commission as described in Section 6.1.

As an exception, the Applicant may specify equipment that has not yet received California Energy Commission certification, but the equipment must be certified prior to incentive payment.

Claim Request Review; Pending Payment; Completed. These statuses indicate that the final incentive amount has been reserved, and the system has already been interconnected with the Utility.

New panels added to an existing inverter that is already in service are eligible to receive a MASH incentive if the previously installed solar energy system met Program requirements at the time of installation and was partially funded by the Program Administrators in accordance with SB1. The new panels must meet the criteria for new systems found in Section 2.2.1.

2.2.2 Eligibility of Replacement PV Systems

Replacement solar energy systems may be eligible for the MASH Program provided that it meets the criteria for new systems found in Section 2.2.1 and the removed system is outside the warranty guidelines of the Self-Generation Incentive Program, the California Energy Commission's Emerging Renewables Program, or Rebuild a Greener San Diego Photovoltaic Program.

2.2.3 Equipment Must Serve On-Site Electrical Load

To be eligible for MASH incentives, the system must be sized so that the amount of electricity produced by the system primarily offsets part or all of the Tenant or Common area electrical needs at the Project Site. Unless additional load substantiation documentation is submitted, the estimated annual kWh production of the proposed system as shown on the EPBB Calculator may not be higher than the sum of the previous 12-month energy usage(s) for all eligible meters.

For MASH systems, common load areas will be subject to the same rules as above and will be considered separately from tenant areas. Tenant units will be aggregated for sizing limits. For example, up to 50 kW of a system may be allocated to 10 units in a building without requiring system size justification because the average will be 5 kW or less.

A solar customer participating in NEM Aggregation pursuant to a utility NEM tariff may be eligible for incentives up to the total annual electrical load (kWh) of the multiple meters that the generating system is offsetting. The system's annual production capacity may not exceed the total annual electrical load of all meters, defined as the Generating Account and all Aggregated Accounts, in the NEM Aggregation arrangement filed with the Utility. Eligible NEM Aggregation participants must comply with the 1MW cap.

2.2.4 System Size

The minimum system size eligible for an incentive is 1 kW CEC-AC. The maximum incentive provided for a Host Customer Site (see Site definition) under the MASH Program is 1,000 kW (1 MW) CEC-AC; however, a Host Customer Site may elect to install up to 5 MW of generation.[16] If an Applicant has already received funding for 1 MW from another solar incentive program (such as the SGIP or ERP), they may apply for up to another 1 MW of new generation under the MASH Program on the same Project Site as long as they can demonstrate that the electricity produced by the combined system sizes does not exceed the actual energy consumed during

[16] The CSI Program and statutes only allow for customers to receive incentives up to the first MW.

the previous 12 months at the Site, based on the process provided in Section 2.2.3. In accordance with Senate Bill 1 (2006), no solar energy systems that exceed a customer's onsite load(s) will receive a MASH incentive.

Program Administrators will use the CEC-AC rating, but not a Design Factor[17], to determine eligibility according to these minimum and maximum sizes. Program Administrators will also use the CEC-AC rating without a Design Factor to determine eligibility for the EPBB incentive.

For all systems, the system size must be calculated using the CEC-AC rating standards,[18] including inverter DC-to-AC losses. To calculate the CEC-AC rating, the following formula should be used:

System Size Rating (kilowatts) = Quantity of Photovoltaic Modules x CEC Rating of Photovoltaic Modules x CEC Inverter Efficiency Rating/ 1000 (watts/kilowatt)

However, for the Program Administrators to allocate applications against their MW, they will multiply the system size rating by a Design Factor that reflects the system's "effective capacity."

For systems applying for the EPBB incentive, this is relatively straightforward, since this ratio is equal to the Design Factor generated by the EPBB calculator. Thus for EPBB systems, system size is equal to the system size rating times the Design Factor generated by the EPBB calculator for that system.

2.2.4.1 System Sizing Based on Future Load Growth

In the case of Applicants with new or expanded sites with no electric bill history or where the existing electric bill does not reflect the Applicant's expected expanded consumption, the Applicant must include an estimate of the expected expanded consumption. An engineering estimate is preferred. The engineering estimate must include the appropriate substantiation of the forecast of the Host Customer Site's annual energy use (in kWh) if the generating system size is based on future load growth, including new construction, load growth due to site expansion or other load growth circumstances. Suggested methods of demonstrating load growth include Application for Service with corresponding equipment schedules and single line diagram; building simulation program reports such as eQUEST, EnergyPro, DOE-2, and VisualDOE; or detailed engineering calculations or lists of equipment with corresponding equipment schedules. The Program Administrator will verify the load growth predicted before moving forward with the Confirmed Reservation Notice. Systems that are 5 kW or less, are assumed to comply with being sized to serve on-site electric load and do not require substantiation. See Section 2.2.3 for information on calculations for MASH systems.

[17] The Design Factor is a ratio comparing a proposed system's expected generation output with that of a baseline system.

[18] CEC-AC is a standard for a rating a system's power that is based upon 1,000 Watt/m2 solar irradiance, 20 °Celsius ambient temperature, and 1 meter/second wind speed. The CEC-AC Watt rating is lower than the Standard Test Conditions (STC), a Watt rating used by manufacturers.

2.3 Energy-Efficiency Requirements

2.3.1 Walkthrough Audit / Multifamily Energy Efficiency Program Enrollment

An energy efficiency walkthrough audit or enrollment in either a utility, a regional energy network (REN), community choice aggregator (CCA) or federally provided whole-building multifamily energy efficiency program is required for all existing multifamily low income housing communities to be eligible for a MASH incentive.

Acceptable audit protocols consist of an onsite walkthrough audit at American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Level 1 or higher. The audit must have been conducted within the past three years from the initial MASH application submittal date. These types of audits may be offered by the utilities or Third-party providers. The Host Customer is responsible for any or all costs associated with an ASHRAE walkthrough audit or any equivalent walkthrough audit through a Third-party provider or if applicable, costs associated with those that are available through a utility program. After an audit is performed, the Host Customer is responsible for submitting a copy of the completed Energy Efficiency Audit ASHRAE Level 1 or higher documentation. A Title 24 report will not be accepted as proof of an energy efficiency walkthrough audit.

In lieu of an onsite walkthrough audit as described above, proof of enrollment in a utility, REN, CCA or federally provided whole-building multifamily energy efficiency program must be submitted.

2.3.2 Energy Efficiency Disclosure Form

The Energy Efficiency Disclosure, included in the Reservation Request Application, must be signed and completed by the Host Customer. The Disclosure certifies that the Program Administrator has provided the Host Customer with information regarding their building that enables them to make informed decisions on energy efficiency. The Disclosure identifies which, if any, energy efficiency measures will be taken. If measures are to be installed after the installation of the solar energy system, then the Host Customer shall declare on the Disclosure which measures have or will be installed.

Additionally, the Host Customer acknowledges that the following information has been reviewed:

- Most recent 12 months of the building's energy consumption.
- List of building energy use assessment services and tools available for use by the building owner for further investigation—for commercial buildings, this must include information on available retro-commissioning services.
- List of possible cost-effective energy efficiency measures applicable to the building.
- List of current utility energy efficiency rebates and incentives that are available.

2.4 Energy Saving Assistance (ESA) Program Requirements

The Applicant will be required to submit a list of all tenant addresses within the apartment complex as part of the Reservation Request Review process. The address must list the street address and unit number for each tenant at the project site e.g. 1415 Monterey Road Apt. #1. At a minimum the Program Administrator will provide the list to the utility ESA program staff on a monthly basis for follow up regarding ESA program enrollment.

The Program Administrator will also provide a notice to MASH building owners regarding ESA program information that the building owner is then required to post on site and be made accessible to the tenants.

To receive a copy of the ESA notice to post onsite, the building owner can go to Appendix G to print a copy or contact your Program Administrator. If you would like to request a copy of the ESA notice in a language other than English, please contact your Program Administrator for availability.

2.5 Job Training Requirements

In order to be eligible for a MASH incentive, Contractors must follow all the MASH job training requirements described in this section.

For each MASH project, Contractors must provide at least one student or graduate of a job training program with at least one full paid day (8 hour day) of work for each 10kW (CEC-AC) of system size up to 50kW. Table 4 below outlines the required number of trainees per project system size.

Table 4
Job Training Requirement Matrix

System Size (CEC-AC)	Job Training Opportunities (JTO)
0 -<10kW	1 JTO and no less than 8 hours
10kW - <20 kW	2 JTOs and no less than 16 hours
20kW - <30kW	3 JTOs and no less than 24 hours
30kW - <40kW	4 JTOs and no less than 36 hours
40kW and greater	5 JTOs and no less than 40 hours

The training(s) can be completed on either the MASH solar installation at the MASH project site, or in a support role on the MASH project, including but not limited to direct work on solar project installation, project design/project engineering, or project management/coordination. Current employees of the solar installer may be eligible to meet this requirement if they graduated from the eligible job training program within 12 months of the installation project.

2.5.1 Contractor Job Training Responsibility

As part of the Job Training requirement, Contractors are responsible for adhering to the following requirements:

- The Contractor is responsible for finding and hiring the job trainee(s) for each MASH installation in accordance with the number of job trainees required for the project described above.

- The Contractor must pay job trainee(s) for time spent on each MASH installation, at a rate consistent with the contractor's entry level or temporary worker wage.

- Contractor's insurance must cover the employment of the MASH job training hires, including temporary hires if the job training organization/program does not provide liability coverage for its trainees.

- Contractor must submit the **Job Training Affidavit** to the MASH Program Administrator at the ICF stage. The affidavit identifies the names of the eligible job training program and job trainee(s) used for each MASH installation, types of jobs completed and hours worked. Both the Contractor and MASH job trainee(s) must complete and sign this affidavit after the installation is completed. See Appendix F for Job Training Affidavit.

  Types of Job Training in the Affidavit:

  In order to align with the industry standards the below categories from the Affidavit are broken into the NABCEP job task analysis categories:

  <u>Directly work on solar installation</u>
  - Installing Electrical Components
  - Installing Mechanical Components
  - Completing System Installation
  - Conducting Maintenance and Troubleshooting Activities

  <u>Project Design/Project Engineering</u>
  - Designing Systems

  <u>Project management/coordination</u>
  - Managing the Project

2.5.2 Eligible Job Training Programs

Job training programs that are eligible to participate in MASH include those offered by a California Community College or other PV-training programs offered to the public by local government workforce development programs, community non-profits, private enterprises, or the electrical workers union with 40+ hours of instructional and/or hands-on PV installation and design training.

2.5.3 Job Training Requirement Exception

The following are the only two cases where a MASH project can receive incentives without completing the job training:

A) If the MASH installation was completed while the MASH project was on the waitlist prior to the issuance of Decision 15-01-027. These are projects that were placed on "Waitlist" status prior to January 30, 2015. The Contractor, in this case, is exempt from the job requirement for that MASH project, but must meet the 50% Tenant Economic Benefit requirement to receive Track 1D incentive funding.

B) If the contractor is unable to find an eligible job training program within 50 miles from the MASH project site, they must do both of the following in order to receive MASH incentives:

1. Applicant must submit proof that a search was completed and that no eligible training programs are located within 50 miles of the project site.

2. Contractor must complete community outreach at the MASH project site with the low income tenants. As proof of community outreach, at minimum the following documents must be submitted (but are not limited to):

   - A flyer or other marketing material that advertises the community outreach event

   - A presentation to the MASH tenants at the MASH project site about the solar installation and the process of installing a solar energy system.

   - A sign-in sheet for individuals who attended the community outreach event.

MASH administrators will review cases outside of what is described above on a case by case basis.

2.6 Affidavit Ensuring 50% Tenant Economic Benefit

In order to be eligible for Track 1D incentives, the Host Customer must demonstrate that a portion of the solar energy system that is allocated to offsetting tenant load through VNM will result in the tenant receiving at least 50% of economic benefit of the allocated generation on a monthly basis for the life of the system or 20 years, whichever is less. To demonstrate that this requirement has been met, the Host Customer must sign an Affidavit Ensuring Economic Tenant Benefit in addition to the completed VNM Allocation Form. See Appendix E Affidavit Ensuring 50% Tenant Economic Benefit. This requirement is met by completing and submitting the Affidavit Ensuring 50% Tenant Economic Benefit, not through assigning 50% or more benefit to tenants through VNM or the VNM Allocation form.

2.7 Warranty Requirements

California Public Utility Code 387.5(d)(4) requires that all solar energy systems that receive an incentive must have a warranty of not less than 10 years to protect against defects and undue degradation of electrical generation output.

- All solar energy equipment for electricity generation (PV modules, inverters, solar collectors, tracking mechanisms, heat exchangers, pumps, and heat driven cooling systems) shall have a minimum 10-year manufacturer performance warranty to protect against degradation of electrical generation output of more than 15% from their originally rated electrical output.

- All contractors shall provide a minimum 10-year warranty to provide for no-cost repair and replacement of the system for any expenses not otherwise covered by the manufacturer.

- All contractors shall provide a minimum 10-year warranty to protect the purchaser against more than a 15% degradation of electrical generation output that may occur as a result of faulty installation.

- For self-installed systems, the warranty need not cover the labor costs associated with removing or replacing major components because any repairs would be done by the self-installer or at the self-installer's expense.

- Meters must have a one-year warranty to ensure against defective workmanship, system or component breakdown, or degradation in electrical output of more than fifteen percent from their originally rated electrical output during the warranty period. For meters that are integrated into the inverter, the meter warranty period must be 10 years.

System Owners will acknowledge on the Incentive Claim Form that they have received a 10-year warranty for no-cost repair and replacement of the solar energy system.

2.8 Performance and Permanency Requirements

Equipment installed under the MASH Program is intended to be in place for the duration of its useful life. Only permanently installed systems are eligible for MASH incentives. This means that the solar energy system must demonstrate to the satisfaction of the Program Administrator adequate assurances of both physical and contractual permanence prior to receiving a MASH incentive.

Physical permanence is to be demonstrated in accordance with industry practice for permanently installed equipment. Equipment must be secured to a permanent surface. Any indication of portability, including but not limited to temporary structures, quick disconnects,

unsecured equipment, wheels, carrying handles, dolly, trailer, or platform, will deem the system ineligible.

The MASH Program will allow the installation of approved hinge release technology if required by local building and permitting agencies to maintain the integrity of the solar system while also satisfying the program requirement of permanent installations.

In rare occasions, there may be extenuating circumstances that warrant equipment relocation. Allowance of the relocation to continue to receive MASH incentives is up to the sole discretion of the Program Administrators. System Owners who have received an EPBB Incentive and have relocated their system must orient their relocated equipment to produce at least the same generation as their initial EPBB Incentive payment was based upon. Contractual permanence corresponding to a period of 10 years is to be demonstrated as follows:

- All agreements involving the solar energy system receiving an incentive are to be provided to the Program Administrator for review as soon as they become available, but at the proof-of-project milestones stage or the incentive-claim stage at the latest. These agreements include, but are not limited to, system purchase and installation agreements, warranties, leases, energy or solar services agreements, energy savings guarantees, and system performance guarantees.
- The System Owner agrees to notify the Program Administrator in writing a minimum of 60 days prior to any change in either the site location of the solar energy system or change in ownership of the generation system if the change(s) takes place within the applicable warranty period. The warranty period for the MASH Program is 10 years.
- If the solar energy system is removed prior to end of the 10 year warranty period, either:
    - The solar energy system may be installed at another site within the Program Administrator service territory within six months. The relocated system installed at the alternate site would not be eligible for an additional MASH Incentive; or
    - The System Owner would be unable to participate in the MASH Program for any additional installations under the MASH Program, including any active reservations that have not yet been paid.
    - A mandatory Site inspection is required for all relocated equipment. See Section 4.6.1 for more the Onsite Field Inspection.

Failure to re-install the solar energy system within 6 months will result in the return of the EPBB Incentive payment.

2.9 Interconnection to the Electric Utility Distribution System

All solar electric generating systems receiving incentives under the MASH Program must be connected to the local electric utility's distribution system. The system interconnection, operation, and metering requirements for solar energy systems shall be in accordance with the local electric utility rules for customer generating facility interconnections. To connect a solar energy system to the utility distribution system, Host Customers, and/or System Owners will be required to execute certain documents such as, but not limited to, an Application to Interconnect

a Generating Facility and a Generating Facility Interconnection Agreement or Net Energy Metering (NEM) Agreement with the local electric utility.

Applicants, Host Customers, and System Owners are solely responsible for submitting interconnection applications to the appropriate electric utility interconnection department as soon as the information to do so is available to prevent any delays in system parallel operation. Please note that there may be insurance requirements for the Host Customer associated with the utility interconnection process.

Proof of interconnection and parallel operation is required prior to receiving an incentive payment. The local electric service provider will convey proof of interconnection to the Program Administrator. MASH Incentive payments will not be made until the Program Administrator confirms valid interconnection.

A Host Customer is not eligible for a Reservation Confirmation if the solar electric generating system has been interconnected for more than 12 months.

For more information on electric grid interconnections, contact your local utility. It is the sole responsibility of the MASH Program System Owner and Host Customer to seek and obtain approval to interconnect the solar electric system to a utility's electric distribution system. System Owners and Host Customers participating in the MASH Program should immediately contact the utility to seek guidance on how to apply for interconnection. Contact information is found in Section 1.4 (Contact Information & Other Useful Resources).

2.10 Metering Requirements

The MASH Program requires accurate energy production meters for all Projects that receive MASH Incentives. Accurate measurement of solar energy output is of paramount importance to ensure optimum value for both solar owners and ratepayers. For solar electric generating systems receiving an EPBB Incentive, a basic meter with accuracy of ±5 percent is required. An extensive discussion on metering is contained in the Technical Section under Section 5.

EPBB Program participants must provide Program Administrators or their authorized agents with physical access to the meter for testing or inspection, and if applicable, data gathering. If the Host Customer's meter is not readily accessible, such access will be by appointment. To avoid inconvenience to Customers, Solar Contractors are encouraged to locate meters in areas that are easily accessible.

2.11 Inspection Requirements

It is the intent of the MASH Program to provide incentives for reliable, permanent, safe systems that are professionally installed, and comply with all applicable federal, state, and local regulations. Program Administrators will conduct a system inspection visit for each Incentive

Claim Forms submitted to verify that the project is installed as represented in the application, is operational, is interconnected, and conforms to the eligibility criteria of the MASH Program[19].

A mandatory Site inspection is also required for all relocated equipment. See Section 4.6.1 for more on the Inspection process.

2.11.1 Inspector Training Criteria

The CPUC requires that all system inspection visits be performed by trained personnel, whether the inspection is performed by utility interconnection inspectors, other utility personnel, or contractors. The Program Administrators have developed and submitted a consistent statewide site inspectors' training plan to the CPUC's Energy Division, which will be the basis for determining status of personnel as trained.

2.12 Measurement and Evaluation Requirements

To be eligible for MASH Incentives, all Applicants, Host Customers, and System Owners must agree to comply with the terms and requirements of the measurement and evaluation program. This includes providing access to the Program Administrators and/or third parties contracted by the CPUC and/or Program Administrator access to the site and any available data, including but not limited to affidavits, California Utility Allowance Calculator (CUAC) analysis and information and/or documentation collected on the solar energy system.

2.13 MASH Program Database Requirements

One of the notable features of the MASH Program is its online database. The Program Administrators are maintaining an up-to-date application processing database named PowerClerk, which is also accessible via the http://www.gosolarcalifornia.ca.gov/ website or csi.powerclerk.com. The database allows program participants to complete new incentive applications and submit incentive claims by uploading PDF documents and submitting them online. By utilizing PowerClerk, program participants are able to fully apply online and do not have to spend time or money on sending in hardcopy documentation.

The CSI Program has also created the California Solar Statistics (CSS) website that provides both detailed program data and easily accessible high-level data gathered through the MASH online application tool, PowerClerk. The MASH budget report, available in CSS, will show the funds that are available for both MASH 1A/1B and MASH 1C/1D. There is a public export of PowerClerk data on a weekly basis. There are charts and tables made from the public export PowerClerk data available on www.CaliforniaSolarStatistics.ca.gov. The public export is typically uploaded midweek.

The Host Customer and System Owner shall agree to allow all information provided as part of the reservation process to be entered into a statewide database that will permit tracking of

[19] All MASH systems will be inspected.

application for this and other incentive programs. Access to this database will be limited to Program Administrators and the California Public Utilities Commission.

2.14 Additional Requirements and Terms

In addition to the Program eligibility criteria and requirements described above and elsewhere in the Handbook, there are a number of additional items required of MASH Program participants. These additional requirements and terms are discussed more fully in Appendix B.

3. MASH Incentive Structure

This section provides a general overview of the MASH incentive structure. Table 5 provides an overview of the incentive structure under the MASH Program since program inception.

Table 5
MASH EPBB Incentive Structure

	Track 1A Common Area (per watt)	Track 1B Tenant (per watt)	Track 1C Common, Non Virtual Net Metering (VNM) or VNM Tenant Load with <50% Tenant Benefit (per watt)	Track 1D VNM Tenant Load with >50% Tenant Benefit (per watt)	Track 2 (per watt)
Reservation Requests that are on "Waitlist" status prior to January 30, 2015 and Reservation Request received after January 30, 2015	Closed	Closed	$1.10	$1.80	Closed
Reservation Requests Reviewed on or after July 14, 2011	$1.90	$2.80	N/A	N/A	Closed
Reservation Requests Reviewed before July 14, 2011	$3.30	$4.00	N/A	N/A	$ Varies

3.1 Expected Performance Based Buydown (EPBB) Incentives

The MASH Program will pay incentives for projects through an up-front incentive known as an EPBB. These EPBB incentives are based on an estimate of the system's future performance. EPBB incentives combine the benefits of rewarding performance with the administrative simplicity of a one-time incentive paid at the time of project completion.

The Program Administrators will use the California Energy Commission's CEC-AC method to determine the system rating. The following formula determines the EPBB incentive:

EPBB Incentive Payment = Reserved Incentive Rate x System Rating[20] x Design Factor

The Design Factor is a ratio comparing a proposed system to a reference system:

$$\text{Design Factor} = \frac{\text{Proposed System}}{\text{Reference System}}$$

Details on calculating the Design Factor are found in the Technical Section, Section 6.2, below.

Please refer to the EPBB User Guide for more detailed explanation of the calculator's methodology and instructions, at www.csi-epbb.com.

For other solar electric generating systems, the Design Factor is the Surface Orientation Factor (SOF)[21]. The SOF is determined by reading the value from the chart Surface Orientation Factor for the location, tilt and azimuth of the system. Charts of SOF for various California locations may be found in Section 8. The chart for the closest location to the system's location should be chosen and the SOF determined by reading it off of the chart using the system's tilt and azimuth. Note that the described EPBB methodology is appropriate for solar energy systems displacing only electric load.

3.1.1 EPBB Calculator Modifications

The CPUC and its Program Administrators have developed an EPBB calculator that helps Applicants determine the EPBB incentive level. As it gains experience with the EPBB and the performance of the California Solar Initiative, the CPUC reserves the right to modify the calculator at any time without advance notice to Applicants.

However, if the calculator is revised between the time an Applicant submits an application and the Program Administrator's Pending Payment stage and the revision(s) alter the project's incentive amount, the Program Administrator (PA) will notify the Applicant by letter (PA notification letter) and/or email.

If the Applicant received a Reservation Confirmation notice *before* such a calculator revision, s/he can either:

A. Resubmit the application using the new calculator (If the Applicant chooses to resubmit, s/he will not lose his/her place in the queue or application fee); or
B. Notify the PA that s/he wishes to remain at the incentive level calculated in the existing application using the modified calculator (even if the incentive would drop under the new calculator).

---

20 CEC-AC System Rating (kilowatts) = Quantity of Modules x CEC Rating of Photovoltaic Modules x CEC Inverter Efficiency Rating / 1000 (watts/kilowatt)

21 The "Surface Orientation Factor" and how it is calculated is detailed in "Effects of Tilt and Azimuth on Annual Incident Solar Radiation for United States Locations", Proceedings of Solar Forum 2001, April 21- 25, Washington D.C. SOF charts for various California locations may be found in Section 8 of this Handbook. Shade measurements should be taken at the major corners of the array, and should not be more than 40 ft apart.

In both cases, the Applicant must notify the PA of his/her intent, in writing, within 30 days of the date of the PA notification. If the Applicant does not notify the PA of his/her intent within 30 days of the date of the PA notification, the application will remain in the queue at the level projected under the calculator used in the initial application process.

If the Applicant has *not* received a Reservation Confirmation notice before such a calculator revision, the PA shall notify the Applicant of the calculator change and how it impacts the incentive amount in the Application when the Reservation Confirmation notice is issued. The notification shall contain a response portion wherein the Applicant shall sign whether they accept the newly calculated incentive or wish to withdraw their application. The Applicant must either:

A. Return the notification to the PA indicating s/he accepts the recalculated incentive amount using the new calculator (If the Applicant chooses to resubmit, s/he will not lose his/her place in the queue or application fee); or
B. Return the notification to the PA indicating s/he wishes to withdraw the application (If the Applicant chooses to withdraw the application, the PA will reimburse the application fee).

In both cases, the Applicant must notify the PA of his/her intent, in writing, within 30 days of the date of the PA notification. If the Applicant does not resubmit or withdraw his/her application within 30 days of the date of the PA notification, the Program Administrator will cancel the application, and the Applicant will generally lose both his/her application fee and place in the queue.

3.1.2 EPBB Incentives for MASH Installations

MASH installations will be provided a one-time payment under the EPBB program. The amount of the EPBB incentive payment is calculated pursuant to the formula in Section 3.1, with the incentive rate portion of the formula determined as shown in Table 3 (Section 1.1.3).

3.2 Incentive Limitations

If the Project is installed as described on the Reservation Request Package and all Program and Contract terms and conditions are complied with, including timely submission of all documents described in the MASH Program Handbook, the Program Administrator will pay a MASH incentive to the entity designated as the MASH incentive recipient. The Program Administrator reserves the right to modify or cancel the MASH incentive if the actual installation of the solar energy system differs from the proposed installation, if the solar energy system fails inspection, if the solar energy system is not installed by the date shown on the Reservation Confirmation and Incentive Claim Form, and/or if the documents submitted fail to meet the requirements of the MASH Program Handbook Any system changes or additions made after the Incentive Claim approval must be reported to the Program Administrator and utility interconnection departments. Failure to notify the Program Administrator may result in an immediate Applicant and/or Contractor failure.

Incentive amounts and project eligibility for the MASH Program are limited by a number of factors, including:

- Total eligible project costs
- Other incentives or rebates received
- Project size and Host Customer Site limitations

3.2.1 Total Eligible Project Costs

No Project can receive total incentives (incentives from the MASH Program combined with other programs) that exceed total eligible project costs. The Applicant must submit project cost details to report total eligible project costs and to ensure that total incentives do not exceed out-of-pocket expenses for the System Owner. Total eligible project costs cover the solar energy system and its ancillary equipment. Equipment and other costs outside of the project envelope as listed below are considered ineligible project costs. For large, multifaceted projects where the solar energy system costs are embedded, applications must include a prorated estimate of the total eligible costs for the solar energy system.

The following costs may be included in total eligible project cost:

1. Solar equipment capital costs, including tracking systems and other ancillary equipment associated with the solar energy system.
2. Engineering and design costs for solar energy systems.
3. Construction and installation costs. For projects in which the generation equipment is part of a larger project, only the construction and installation costs directly associated with the installation of the energy generating equipment are eligible.
4. Engineering feasibility study costs
5. Interconnection costs, if applicable, including:
    a. Electric grid interconnection application fees
    b. Metering costs associated with interconnection
6. Building permitting costs
7. Warranty and/or maintenance contract costs associated with eligible project cost equipment
8. Sales tax and use tax
9. On-site system measurement, monitoring and data acquisition equipment.
10. Customers may claim certain mounting surface costs as eligible project costs. Costs may include mounting surfaces for the photovoltaic module/solar collector and/or the materials that provide the primary support for the modules. Only the percentage of mounting surface directly under the photovoltaic module/solar collector is eligible.
11. Cost of capital included in the system price by the vendor, contractor or subcontractor (the entity that sells the system) is eligible if paid by the System Owner.

In cases in which an installation contract encompasses all costs associated with the installation of a solar energy system and additional measures such as energy efficiency, other renewable generating technologies, etc., the contractor must delineate the costs for each measure separately in the agreement.

3.2.1.2 Reportable Project Costs

All systems receiving a MASH incentive are required to enter the costs identified below in the MASH Program's online database, PowerClerk, in order for the Program Administrators to track and maintain solar energy system cost data.

- PV Module – the cost for the number of modules installed
- Inverter – the cost for the number of inverters installed
- Permitting Fees – only include the cost of the permitting fees charged by the permitting agency (do not include any costs associated with time and labor in applying for permits)
- Balance of System (BOS) – all other eligible costs associated with the installation of the PV System. Please see Section 3.2.1 for a description of eligible project costs.

3.3 Other Incentives or Rebates

Customers may not receive MASH incentives for the same self-generation equipment from more than one Program Administrator (i.e., PG&E, SCE, and CSE). For projects receiving incentives under other programs, the MASH incentive may be reduced, depending on the source of the other incentive. For projects that receive "other incentives" for the same generating equipment that are funded by California investor-owned utility ratepayers (e.g., utility or California Energy Commission public goods charge programs), the MASH incentive is discounted by the amount of the "other incentive." For projects that receive "other incentives" funded from other sources than utility ratepayers (e.g., federal and state grants, air district grants or tax credits) no adjustment is made to the MASH incentive, except where a MASH incentive would otherwise cause total incentives to exceed total costs.

In no event may the combined incentives received from MASH Program and other funding sources exceed the total eligible project cost. Host Customers, Applicants and System Owners are required to disclose information about all other incentives, including incentives for equipment or systems ancillary to the solar energy system, post-installation performance payments, or additional incentives. The Host Customer and System Owner understand that other program rebates, grants, forgiven loans, financial incentives, post-installation agreements, Renewable Energy Credits (RECs or Green Credits), and performance payments are "other incentives" and must be disclosed as soon as those agreements or payments are made. Program Administrators will enter applications into a statewide database that will permit universal tracking of applications for this and other programs.

3.4 Right to Audit Final Project Costs and Affidavits

The Program Administrators reserve the right to conduct spot checks to verify that Project-related payments were made as identified in the final invoices or agreements provided by equipment sellers and/or Solar Contractors. As part of these spot checks, the Program Administrators will require Applicants to submit copies of cancelled checks, credit card statements, or equivalent documentation to substantiate payments made to the equipment seller and/or Solar Contractor. The final amount legally incurred or paid to the equipment seller and/or the final amount paid to the Solar Contractor for the purchase and installation of the

system must match the cost information identified in the Reservation Confirmation and Incentive Payment Claim Form.

To meet this requirement, the System Owner must submit final invoices and/or a copy of the final agreement, and cost documentation must provide sufficient information to identify clearly the equipment purchased and the labor paid. If there is no direct proof of actual payment from the System Owner to an appropriately licensed Solar Contractor or seller, the incentive will be cancelled or reduced. Applicants must explain the difference if the final amount paid by the Applicant is different from the amount of the purchase or installation shown in any agreement or invoice or in the previously submitted Reservation Request.

In addition, the final invoices or agreements should clearly indicate the extent to which the MASH incentive lowered the cost of the system to the System Owner. If the System Owner has entered into an agreement to pay the equipment seller over time rather than in lump sum, the final agreement must indicate the terms of payment and the amount of any deposits or payments paid by Applicant to the equipment seller to date. The System Owner must pay the cost of any system installation prior to submitting a payment request to the Program Administrator.

When submitting this documentation, Applicants are encouraged to remove their personal account numbers or other sensitive information identified in the documentation.

The PAs and/or the CPUC reserve the right to request further documentation that demonstrates compliance with all program requirements, CPUC program audits, CPUC data requests, and/or additional requests by the PA or CPUC through the life of the Program. Examples of supporting documents may include (but not limited to) documents associated with the job training, tenant benefit affidavits, and all documentation submitted to the PA for MASH Program approval.

3.5 Site and Host Customer Limitations

There are restrictions on the amount of incentive funding a Host Customer can reserve and receive. Host Customers may reserve up to a maximum of 1 MW of incentive funding from the MASH Program for a single Site for the duration of the MASH Program.

3.6 Limitations on Installed Cost

The MASH program incorporates mechanisms to ensure participating PV system costs are within the average project cost range. Total Project Cost is defined as:

Total Project Cost ($)/CEC-AC (Watts) = $/Watt

To ensure high cost projects are justified, the Program Administrators will require documentation stating the reasons system cost exceeds the limit displayed at www.CaliforniaSolarStatistics.ca.gov.

The following methodology is used to determine the soft cap for installed systems costs:

- For the beginning of the program, the MASH project data from 2013 forward will be used to calculate the MASH cost cap.
- The cost cap is calculated by using a simple mean, updated weekly, based on MASH data. The data set will have a minimum of 30 projects at any given time. Newly completed projects will be included in the cost cap calculation while older projects are evaluated for removal from the data set once the minimum 30 projects is reached. National data shall be considered on an annual basis, and the cost cap methodology may be revised as needed. Third party-owned systems will be excluded from the data sets used to calculate the caps, but all MASH systems will be subject to the cost caps.
- The cost caps will be calculated to equal to the simple average installed cost per watt (CEC-AC), plus $1.00.

If the system cost exceeds the soft cost cap, the Host Customer is required to sign the High Cost Justification and Acknowledgement Form that describes the reasons for exceeding the soft cost cap and explains to the customer that the cost of their solar energy system is much higher per watt than the larger majority of the solar energy systems submitted to the MASH Program for incentives. Please see Section 4.2.4.4 for more information.

A System Owner's project may exceed the cost limit only if he/she or the Applicant can demonstrate to the Program Administrator through appropriate documentation that the particular project requires a special configuration that will drive project costs above the limit. Appropriate documentation consists of a letter, which outlines the system components or labor requirements that cause a particular project to exceed the reasonable cost limit. Examples include but are not limited to solar installations on historic buildings, tracker systems, new solar technologies, or other specialized products. Program Administrators may perform a site inspection to verify the documentation and reserve the right to audit the final project costs as discussed in Section 3.4.

Program Administrators will verify that the total cost associated with the reservation matches the system cost identified on the installation contract executed between the System Owner and Solar Contractor.

4. Application Process for MASH Projects

Through the MASH Program, funding may be reserved for property owners who have committed to purchase and install an eligible solar energy system at a given project Site. A funding reservation confirmation provides the purchaser assurance that the reserved funds will be available when the incentive claim is made. For completed applications, reservations are made on a first-come, first-served basis, and last for the duration of the applicable reservation period. The MASH Program uses an online application tool to simplify the application process and confirm the rebate amount reserved, contingent on receiving all documents. To apply for a MASH incentive online visit www.csi.powerclerk.com or your Program Administrator's website for downloadable forms.

Table 6 shows Reservation period for the MASH program.

Table 6
Reservation Periods

Program	System Size	Reservation Period
Multifamily Affordable Housing (MASH)	All*	18 months

*All CSI-eligible system sizes.

4.1 Application Process for MASH Projects

This section describes the application process for MASH Track 1C and Track 1D projects.

Track 1 provides fixed, up front, capacity-based incentives for qualifying solar energy systems, using the EPBB methodology. Incentives under Track 1 depend on the following:

- Whether a portion of the system offsets common area usage, Non-VNM tenant load, or VNM tenant load where tenant receives less than 50% of economic benefit of allocated generation (Track 1C);

  or

- VNM tenant load where the tenant receives at least 50% of economic benefit of allocated generation on a monthly basis for the life of the system or 20 years, whichever is less (Track 1D).

A property may receive both Track 1C and 1D incentives for the same project if the project will offset both common area and tenant load and meet all associated requirements. Track 1C and Track 1D incentives will be paid based on how the system provides electricity. For example, if a 100 kW solar installation offsets both common area and tenant load, and 60 percent of the electricity output of the system is dedicated to common area load and 40 percent of the electricity output is dedicated to tenant load, the Applicant will receive Track 1C incentives for 60 kW, and Track 1D incentives for 40 kW, as long as all program requirements are met.

4.1.1 3-Step Application Process for MASH Track 1C and 1D

There are three primary steps for MASH Track 1 Applicants as follows:

1. Complete and submit the **Reservation Request** Package and Application Fee (Application Fee is applicable for systems ≥ 10 kW)
2. Complete and submit the **Proof of Project Milestone** Package
3. Complete and submit the **Incentive Claim Form** Package

MASH Applicants will generally use the 3-Step application process, which, in addition to the Reservation Request Application and Incentive Claim steps, includes a separate Proof of Project Milestone (PPM) step at which time an Executed Purchase and Installation Agreement or Alternative System Ownership Agreement is due. However, if a MASH applicant provides these documents at the time of Reservation Request Application submittal, the PPM step will no longer be required.

4.1.1.1 **Step # 1: Submit Reservation Request Package and Application Fee (Application Fee is applicable to systems ≥ 10 kW)**

The Reservation Request Package is submitted in the first step of the application process.

To reserve a specified incentive amount, Applicants must submit the Reservation Request Package, Application Fee, and all required following documentation.

The Reservation Request Package must have signatures[22] of Applicant, Host Customer and System Owner, and should be submitted with the following documentation:

1. Completed Reservation Request Package and Program Contract with Signature (includes completed Energy Efficiency Disclosure)
2. Electrical System Sizing Documentation (new/expanded load only) for projects > 5 kW
3. Documentation of CPUC Code 2852 eligibility
4. Cover Sheet for Public Utilities Code Section 2852 Documentation
5. Document listing all tenant addresses on the property to serve as the Energy Savings Assistance (ESA) Program Referral List (CSV file)
6. Affidavit Ensuring 50% Economic Tenant Benefit
7. Application Fee (Applicable for systems ≥ 10 kW)

[22]Signatures for all submitted documentation are acceptable in the following formats:
Original signed documents, or "wet" signatures
Scanned copies of original signed documents
Faxed copies of original signed documents
Although "wet" signatures are not required on submitted documents, original signed documentation must be maintained by the Applicant, Host Customer and/or System Owner for at least five years from the date of submission. Program Administrators reserve the right to request original signed documents within the five-year period.

8. VNM Load Allocation Form Document (if offsetting tenant load)

Detailed instructions are included with the Reservation Request Package. Refer to Section 4.2 for more information on the above-referenced forms and documents. For more information about the Application Fee, refer to Section 4.1.1.2.

4.1.1.2 **Application Fee Process**

In addition to the Reservation Request Package and required attachments, MASH Applicants applying for systems ≥ 10 kW will also be required to submit an application fee. The application fee is a standardized amount based on the following system size (CEC-AC) criteria:

kW ≤		kW <		FEE
10	-	50	=	$1,250
50	-	100	=	$2,500
100	-	250	=	$5,000
250	-	500	=	$10,000
500	-	1,000		$20,000

Applicants may submit the application fee with the Reservation Request Application. If the application fee is not received with the Reservation Request Application, the Program Administrators will invoice the Host Customer (utility customer of record) after review of the Reservation Request Application package.

The Host Customer will have 30 days to submit payment for the application fee in order to activate the Reservation Request. The payment must reference the Project (by invoice number, facility address, and/or application number).

Program Administrators will accept payments from either the Applicant or a third party on behalf of the Host Customer for a particular project; however, a returned application fee shall only be paid to the Host Customer.

Program Administrators will only accept application fees in the form of a check. Cash, credit cards, money orders, promissory notes, etc. will not be accepted.

Application fees will be linked to reservation numbers, not to the Project Sites; therefore, the Project must be completed under the same reservation number as the one linked to the application fee.

Upon verification of the installed MASH Project and MASH incentive payment, the application fee will be returned in full to the Host Customer. No interest shall be paid on application fees.

4.1.1.3 **Incomplete Reservation Requests**

If an application is found to require clarification, the Program Administrator will request additional information. Applicants have 20 calendar days to respond to the clarification request

with the necessary information. If after 20 calendar days the Applicant has not submitted the requested information, the application will be cancelled. Resubmitted application packages will be treated as new applications (i.e., all required documents must be resubmitted) and processed in sequence along with other new applications.

Incentive funds are not reserved until the Program Administrator receives all information and documentation required for the Reservation Request and the project is approved.

Wait listed projects submitted prior to January 30, 2015, refer to Section 4.8.3.

4.1.1.4 Approval of Reservation Request

Once a Track 1C/1D Reservation Request Package is determined to be complete and eligible, the Program Administrator will reserve a specific dollar amount for a specified system size, and send an initial Reservation Notice to the Applicant. The Notice will list, at a minimum, the approved MASH incentive amount and the date that the Proof of Project Milestone package must be submitted. The initial Reservation Notice also will list the required information that Applicants must submit by the Proof of Project Milestone.

Refer to Sections 4.1.1.6 and 4.2.2 for more information on the Proof of Project Milestone requirements.

The incentive amount per application will be capped at the reserved amount in Step 1 (Reservation Request step). System modifications resulting in an increase in the incentive amount during the PPM or ICF step will not be paid.

Conversely, if the system modification results in a decrease in the incentive amount during the ICF step, the lower of the PPM confirmed reservation amount and the revised incentive will be paid.

4.1.1.5 Reservation Period

Incentives can be reserved for up to 18 months for MASH Track 1C and 1D projects.

4.1.1.6 Step #2: Submit Proof of Project Milestone Package

The initial Reservation is valid only until the Proof of Project Milestone Date. Within 240 calendar days of the date on the initial Reservation Notice, the Proof of Project Milestone package with all supporting documentation must be submitted to demonstrate to the Program Administrator that the project is progressing and that there is a sustained commitment to complete the Project within the allowed timeline.

4.1.1.7 Required Proof of Project Milestone Documentation

The following documentation must be submitted on or before the Proof of Project Milestone date indicated in the initial Reservation Notice.

1. Completed Proof of Project Milestone Checklist

2. Copy of executed contract for System Purchase and Installation (for Host Customer Owned systems only)
3. Copy of Executed Alternative System Ownership Agreement (if System Owner is different than Host Customer)
4. Documentation of an onsite walkthrough energy audit at ASHRAE Level I or higher within the past three years, or proof of enrollment in a utility, regional energy network (REN), community choice aggregator (CCA) or federally provided whole-building multifamily energy efficiency program
5. Documentation requesting Job Training Exemption (if applicable)
6. Documentation of VNM Load Allocation Form (if changed from RR step)

For more information on the above-referenced forms, go to Section 4.2.2.

4.1.1.8 **Incomplete Proof of Project Milestone**

If submitted Proof of Project Milestone documentation is received by the Proof of Project Milestone Date but requires clarification, the Program Administrator will request the information necessary to process that application further. Applicants have 20 calendar days to respond with the necessary information. If, after 20 calendar days, the Applicant has not submitted the requested information, the applications will be cancelled.

4.1.1.9 **Proof of Project Milestone Extension**s

In general, no extensions to the Proof of Project Milestone date are permitted.

4.1.1.10 **Step # 3: Submit Incentive Claim Form Package**

Once Applicants have successfully met the Proof of Project Milestones requirements, the Program Administrator will issue a Confirmed Reservation Notice, which will list the specific reserved Incentive amount and the Reservation Expiration Date. Upon Project completion and prior to the Reservation Expiration Date, Applicants must submit a completed Incentive Claim Form along with all of the necessary documentation to request an incentive payment. The Applicant should submit the Incentive Claim Form and the required supporting documentation after the solar energy system is purchased, installed, and put into operation.

The Incentive Claim Form Package must have signatures of Applicant and Host Customer and should be submitted with the following documentation:

1. Incentive Claim Form with Signatures
2. PMRS Cost Cap Exemption Documentation (if no eligible PMRS is installed)
3. Job Training Affidavit
4. Proof of Community Outreach (if a Job Training Exemption was requested and approved at PPM step)
5. Documentation of VNM Load Allocation Form (if changed from PPM step)

Although the Applicant is not required to submit Proof of Authorization to Interconnect, the Program Administrators will verify interconnection prior to any incentive payment. Refer to Section 4.2.3 for more information about the requirements associated with submitting the Incentive Claim Form package.

Table 7 MASH Track 1C/1D 3-Step Application Process Form and Documentation Requirements

Step 1: Reservation Request Package	More Information
Completed Reservation Request Package, Program Contract with Signature (includes completed Energy Efficiency Disclosure)	Section 4.2.1.1, Section 4.2.1.4
Electrical System Sizing Documentation (new/expanded load only) for projects > 5 kW	Section 4.2.4.1
Documentation of CPUC Code 2852 eligibility	Section 4.2.1.5
Cover Sheet for Public Utilities Code Section 2852 Documentation	Section 4.2.1.6
List of addresses on site for ESA Program Referral List	Section 4.2.1.10
Affidavit Ensuring 50% Tenant Economic Benefit	Section 4.2.1.3
Application Fee	Section 4.2.1.9
Documentation of VNM Load Allocation Form (if offsetting tenant load)	Section 4.2.3.3
Step 2: Proof of Project Milestone Package	
Completed Proof of Project Milestone Checklist	Section 4.2.2.1
Copy of executed contract for system purchase and installation (for Host Customer Owned systems only) or Copy of executed alternative System Ownership agreement (Third-party owned systems)	Section 4.2.1.7, Section 4.2.1.8
Documentation of an onsite walkthrough Energy Efficiency Audit ASHREA Level 1 or higher or proof of enrollment in a utility, REN, CCA or federally provided whole-building multifamily energy efficiency program	Section 4.2.2.4
Documentation requesting Job Training Exemption (if applicable)	Section 4.2.2.5
Documentation of VNM Load Allocation Form (if changed from RR step)	Section 4.2.3.3
Step 3: Incentive Claim Form Package	
Completed Incentive Claim Form with Signatures	Section 4.2.3.1
PMRS Cost Cap Exemption Documentation (if no eligible PMRS is installed)	Section 4.2.3.2
Job Training Affidavit	Section 4.2.3.5
Proof of Community Outreach (if a Job Training Exemption was requested and approved at PPM step)	Section 4.2.3.6
Documentation of VNM Load Allocation (if changed from PPM step)	Section 4.2.3.3

Once the incentive budget becomes fully subscribed within each PA territory the incentive amount per application will be capped at the reserved amount in Step 1 (Reservation Request step). System modifications resulting in an increase in the incentive amount during the PPM or ICF step will not be paid.

Conversely, if the system modification results in a decrease in the incentive amount during the ICF step, the lower of the PPM confirmed reservation amount and the revised incentive will be paid.

4.1.2 PMRS Requirements

PMRS is required for all projects > 10 kW; however, exemptions are allowed for MASH projects provided the cost of the PMRS exceeds the program cost limits.

For MASH systems up to 30kW, the total cost of the metering, communication and PMRS for the first five years following final project approval shall be less than 1% of total PV system eligible project costs (exclusive of metering, communication and PMRS costs).

For MASH systems 30kW and above, the total cost of the metering, communication and PMRS for the first five years following final project approval shall be less than 0.5% of total PV system eligible project costs (exclusive of metering, communication and PMRS costs).

MASH projects eligible for the PMRS cost cap exemption must demonstrate a valid cost proposal (dated within the last six months) that the cost for a minimum level of PMRS service exceeds the cap. Projects are not eligible for the cost cap exemption if the cost proposal is for more than the minimum level of PMRS service.

The Cost Cap Exemption Documentation consists of any of the following items that demonstrate PMRS costs exceed the cost cap:

1. A quote from an eligible PMRS provider indicating the PMRS provider's cost for providing the basic PMRS described in this section; or
2. A quote detailing the equipment, installation, maintenance, and five-year service costs of any communications equipment and service required for the provision of the PMRS (if such equipment and service does not already exist at the Host Customer premise); or
3. An invoice or quote detailing the associated metering system costs (if separate from inverter and only if necessary for the provision of the PMRS); or
4. A letter on the Solar Contractor letterhead showing any additional costs, including labor, materials, overhead and Solar Contractor mark-up, to install and maintain the PMRS.

4.2 Application Forms and Documentation

The following section discusses each of the forms and documentation requirements listed in the subsections above. Refer to the subsection describing the process for your application type to determine which of the following documents are required for your situation. Note that for all submitted documentation requiring them, signatures are acceptable in the following formats:

- Original signed documents, or "wet" signatures
- Scanned copies of original signed documents
- Faxed copies of original signed documents

Although “wet” signatures are not required on submitted documents, original signed documentation must be maintained by the Applicant, Host Customer and/or System Owner for at least five years from the date of submission. Program Administrators reserve the right to request original signed documents within the five-year period.

Electronic submittal of all forms and documentation is mandatory. The online tool must be used to submit these documents.

4.2.1 Reservation Request Package and Required Documentation

4.2.1.1 Reservation Request Package with Signature

To reserve a specified incentive amount, a Reservation Request Package must be submitted with all required documentation attached. All forms are available from the Program Administrators’ website. The equipment seller, Solar Contractor, and any other third party providing service related to a system installation should be identified on the application form, together with a description of the generation site, equipment information and project incentive calculation.

4.2.1.2 Proof of Electric Utility Service for the Site

Eligibility requirements restrict participation in the MASH Program to Customers who are located in PG&E, SCE, or SDG&E service territories and physically connected to the electric utility transmission and distribution system. MASH Applicants are required to provide the property’s utility account number and meter number on the Reservation Request Package as validation of electric utility service for the site.

4.2.1.3 Affidavit Ensuring 50% Tenant Economic Benefit

In order to demonstrate that a portion of the solar energy system that is allocated to offsetting tenant load through VNM will result in the tenant receiving at least 50% of economic benefit of the allocated generation on a monthly basis for the life of the system or 20 years, whichever is less, the Host Customer must sign an Affidavit Ensuring 50% Economic Tenant Benefit.

4.2.1.4 Copy of signed Energy Efficiency Disclosure

See Section 2.3.2 for more information about the disclosure. Energy Efficiency Disclosure is part of the Reservation Request Form.

4.2.1.5 Documentation of CPUC Code 2852 Eligibility

For MASH multifamily residential projects proving low-income status per Public Utilities Code Section 2852, applicants must provide documentation that meets one of the following:

1) For a Multifamily residential complex that is financed with low-income housing tax credits, tax-exempt mortgage revenue bonds, general obligation bonds, or local, state or federal loans

or grants, one of the following signed and executed documents between the property owner/developer and entity issuing financing as listed above must be submitted:

a) Deed Restriction
b) Regulatory Agreement

2) For a Multifamily residential complex where at least 20% of units of the total units are sold or rented to lower income households, one of the following signed and executed documents between the property owner/developer and public entity or non-profit housing provider under Internal Revenue Service Section 501(c)(3) must be submitted:

a) Deed Restriction
b) Affordability Covenant

The documentation of CPUC Code 2852 eligibility must be independently enforceable and verifiable and cannot be contingent upon participation in the MASH program.

For both 1 and 2 above, it is the responsibility of the Applicant to demonstrate that the rents being charged (or initial sale costs of the units) in the multifamily residential complex are or were affordable under the definitions of "affordable housing cost," affordable rent" and "lower income households", as defined in Public Utilities Code Section 2852, all of which terms have the same meanings as in Health and Safety Code Sections 50050 through 50106. If an applicant's documentation submitted pursuant to either 1 or 2 above does *not* come from one of the public entities listed below— all of whom have established authority to regulate affordable housing costs and/or rents—the applicant must present evidence to the MASH Program Administrator that the relevant affordability requirements of the Public Utilities Code and Health and Safety Code have been met for all units presented by the applicant as affordable under these code sections.

For reference, below is a non-comprehensive list of public entities that provide financing for low-income multifamily housing:

- California Tax Credit Allocation Committee (TCAC)
- California Debt Limit Allocation Committee (CDLAC)
- California Department of Housing and Community Development/The California Housing Finance Agency (HCD/CALHF)
- U.S. Department of Housing and Urban Development (HUD)
- A Redevelopment Agency (RDA) or RDA successor agency
- A Housing Authority, or a City or County in the case of a project funded by HUD HOME Funds

The MASH Program Administrator may consult the public entity or non-profit housing provider listed on any applicant's submitted low income documentation to confirm that the property is in good standing and not in violation of the terms of the low income documentation required for MASH program eligibility. For more detailed information regarding Public Utilities Code Section 2852, please see Section 2.1.5. General MASH Eligibility Guidelines.

4.2.1.6 Cover Sheet for California Public Utilities Code Section 2852 Eligibility Documentation

In order to clearly outline how a proposed MASH project achieves California Public Utilities Code (CPUC) Section 2852 eligibility, Applicants are required to submit a cover sheet summarizing key details such as, but are not limited to, property owner name, public entity/non-profit agency name, and expiration date of low income documentation. This will allow Program Administrators to more accurately and efficiently determine eligibility of projects. See Cover Sheet in Appendix D.

4.2.1.7 Copy of Executed Agreement of Solar Energy System Purchase and Installation

The Applicant must submit a copy of an executed agreement to purchase and install the solar energy system with the Reservation Request package only if the solar system is Host Customer Owned.

Agreements must be legally binding and clearly identify the scope of work, terms, price, solar energy system components to be installed. Agreements must be signed by appropriate parties (supplier/Solar Contractor, Host Customer, Applicant and/or System Owner).

The Applicant must provide copies of executed purchase and/or installation agreements with the Reservation Request Package, and the information must be internally consistent and must be consistent with information entered in the PowerClerk Reservation Request. Agreements for the purchase of a system or system equipment must be in writing and must include, at a minimum, the following information:

- The quantity, make and model number (as shown on the California Energy Commission lists of eligible equipment) for the PV modules, inverters, and system performance meters
- The total purchase price of the system before applying the incentive
- Language indicating the purchaser's commitment to buy the system
- Printed names and signatures of the purchaser and equipment seller's authorized representative.

Installation contracts must comply with the Contractors State License Board (CSLB) requirements. Please refer to the CSLB website for more information on CSLB guidelines at www.cslb.ca.gov.

Entities without a valid A, B, C-10 or C-46 contractor's license may not offer installation services or charge for installation in any agreement under the CSI Program.

In addition, these contracts must contain the following information:

- Name, address and contractor's license number of the company performing the system installation
- Site address for the system installation

- Description of the work to be performed
- Total agreed price to install the system
- Payment terms (payment dates, dollar amounts and how the CSI incentive will be applied)
- Printed names and signatures of the purchaser and the company's authorized representative.

The above requirements are sufficient evidence of an agreement to purchase and install a system for cases where a contractor sells and installs the system.

When a General Contractor subcontracts the Solar Installation on behalf of the Host Customer, the subcontract agreement will fulfill the requirements outlined in this section.

4.2.1.8 Copy of Executed Alternative System Ownership Agreement (If System Owner is Different from Host Customer)

Applicant must submit with the Reservation Request Package a copy of Executed Alternative System Ownership agreement only if the solar system is not Host Customer owned.

Agreements must be legally binding and clearly identify the Host Customer name, site address, scope of work, terms and price. Agreements must be signed by the Host Customer and System Owner).

4.2.1.9 Application Fee

For MASH Projects ≥10kW, Applicants must submit application fee that is based on system size (CEC-AC) criteria. See Section 4.1.1.2 for more information on application fees.

4.2.1.10 Energy Savings Assistance (ESA) Program Referrals

Applicant must submit with the Reservation Request Package a Comma Separated Values (CSV) document listing each tenant unit address at the project site. The address must include the street address and unit number for each tenant unit. See section 2.4 for more information on the ESA program requirements.

4.2.2 Proof of Project Milestone Package (for Projects following a 3-Step Process)

4.2.2.1 Completed Proof of Project Milestone Checklist

All Proof of Project Milestone submittals must be accompanied by a completed and signed checklist.

4.2.2.2 Copy of Executed Contract for System Purchase and Installation

See section 4.2.1.7 for information on the Copy of Executed Contract for System Purchase and Installation

4.2.2.3 Copy of Executed Alternative System Ownership Agreement (If System Owner is Different from Host Customer)

See Section 4.2.1.8 for information on the Copy of Executed Alternative System Ownership Agreement (If System Owner is Different from Host Customer)

4.2.2.4 Documentation of Onsite Walkthrough Energy Efficiency Audit ASHREA Level 1 or higher or Proof of Enrollment in a utility, REN, CCA or federally provided whole-building multifamily energy efficiency program

Applicant must submit documentation of an onsite walkthrough energy efficiency audit ASHRAE Level 1 or higher, or proof of enrollment in a utility, REN, CCA or federally provided whole-building multifamily energy efficiency program. See Section 2.3.1 for more details.

4.2.2.5 Documentation requesting Job Training Exemption (if applicable)

If no suitable job training programs are located within 50 miles of the project site, the Applicant must submit proof to the Program Administrator of the efforts made to search for a job training program that meets the program requirements.

In order to meet the job training requirements, the Applicant will also need to submit Proof of Community Outreach (see Section 4.2.3.6) in the Incentive Claim step.

4.2.3 Incentive Claim Form Package

4.2.3.1 Complete Incentive Claim Form with Signatures

A completed Incentive Claim Form must be submitted. It must be read, completed, and signed by both the Host Customer and System Owner (if different). Any changes in the system upon completion of the Project, including any changes to the name of the contractor completing the Project, must include supporting documentation and a recalculated Incentive amount.

For information on the interconnection process, see Section 2.9.

4.2.3.2 Performance Monitoring and Reporting Service (PMRS) Contract or Cost Cap Exemption Documentation

For all EPBB systems > 10 kW and any other systems installing a PMRS, it must be indicated on the MASH incentive Claim Form that a PMRS is installed and name the eligible PMRS provider. All systems installing PMRS must contract with the provider for a minimum of 5 years and must report 15 minute interval production data quarterly to the PAs. The System Owner must provide a copy of the PMRS contract upon request of the PA; however, it is not a requirement to submit the contract in the Incentive Claim package.

Systems receiving a MASH incentive must either indicate the PMRS provider on the Incentive Claim Form or submit PMRS Cost Cap Exemption Documentation if no eligible PMRS is installed (see Section 4.1.2 for details).

See Section 5: Metering Requirements for additional information on PMRS.

4.2.3.3 Documentation of VNM Load Allocation

Applicant must demonstrate that the load allocation of the solar energy system matches the applied for Track 1C/1D incentives. The Applicant will need to provide a copy of the VNM allocation form that is submitted with the interconnection application which shows the load allocation between common and tenant area.

4.2.3.4 Signed Field Verification Certification Form

The Solar Contractor must perform a Field Verification prior to submitting the Incentive Claim Form. The Field Verification Certification Form must be signed by the contractor and submitted to the Host Customer. A copy of the signed Field Verification Form must be retained by the contractor and may be requested by the Program Administrator at any time after an Incentive Claim Form is submitted. A copy of the Field Verification Form can be found on the Go Solar California website: http://www.gosolarcalifornia.org/documents/csi.php. See section 7 for Field Verification requirements.

4.2.3.5 Job Training Affidavit

A job training affidavit must be submitted for all applications funded after January 30, 2015, applying for Track 1C and 1D incentives. The job training affidavit must be completed and must include the job trainee names, classification of the job (Directly work on solar installation, Project design/Project engineering, Project management/coordination), and hours worked. Each job trainee is required to sign the job training affidavit form. See Section 2.5 for the two cases where MASH funding may be received without completing the job training requirement.

4.2.3.6 Proof Of Community Outreach (If a Job Training Exemption was requested at PPM step)

If a job training exemption was submitted by applicant and approved at PPM step, the Applicant is required to submit proof of community outreach. Documentation include the following (but not limited to):

- A flyer or other marketing material that advertises the community outreach event
- A presentation to the MASH tenants at the MASH project site about the solar installation and the process of installing a solar energy system.
- A sign-in sheet for individuals who attended the community outreach event.

4.2.4 Circumstances Requiring Additional Documentation

4.2.4.1 Electrical System Sizing Documentation (New or expanded load only)

Except for systems of 5kW or less which need no sizing documentation (see Section 2.2.4), to confirm that participating distributed generation systems will not exceed the capacity of the Host Customer's previous 12-month historical usage.

4.2.4.2 Owner or Self-Installed System

In situations where the System Owner installs the Project, the Applicant must provide the following information during the first step of the application process:

- An equipment purchase agreement as described above, or
- In cases where there is not a signed agreement to purchase equipment the purchaser may provide invoices or receipts showing that at least 10 percent of the system equipment purchase price (generating equipment and inverters) has been paid to the seller(s).[23]

4.2.4.3 Contractor-Installed System with Separate Seller and Solar Contractor

In situations where the System Owner is purchasing the Project system from one company and hiring a separate company (licensed contractor) for installation, the System Owner must obtain proof of his or her commitment to purchase and install the system in separate documents as follows:

- An equipment purchase agreement as described above, or
- In cases where there is not a signed purchase agreement the System Owner may provide invoices or receipts showing that at least 10 percent of the system equipment purchase price (generating equipment and inverters) has been paid to the seller(s), and
- An installation contract from the second company as described above.

4.2.4.4 High Cost Justification and Acknowledgement Form (if applicable)

[23] An example of this situation is when the purchaser buys new equipment via the Internet or mail order.

In situations where the Applicant submits a project to the MASH Program that exceeds the soft cost cap, the Applicant must provide the High Cost Justification and Acknowledgement Form, found on the Go Solar California and Program Administrators websites that describes the reasons why the project exceeds the Limitations on Installed Cost requirement. It is required that this form be executed by the Host Customer. Please see Section 3.6 for more information.

4.3 Changes to Reservations

4.3.1 Withdrawal

The Host Customer and System Owner agree that either of them may withdraw from the Project for any reason by providing written notice of such withdrawal to Program Administrator. In the event the Host Customer or System Owner so withdraws, the MASH Contract will be cancelled. The Host Customer will retain sole rights to the Reservation and can preserve the Reservation and corresponding Reservation number by submitting a new Reservation Request Package at the same time written notification of withdrawal from the Project is provided to Program Administrator. The Host Customer understands that an increase in the system size will receive funding at the current incentive level at the time of the submittal if the entire available budget for a Program Administrator is reserved for other projects and there is no available funding, the Program Administrator cannot increase the reserved incentive amount. The Host Customer also understands that submitting a new Reservation Request Package will not move or alter the Proof of Project Advancement Milestone Date provided by Program Administrator, if any. The Host Customer further understands that if the Host Customer fails to re-submit a Reservation Request Package at the time of Project withdrawal, the Application will be terminated in its entirety by the Program Administrator and any previously reserved incentive funding will be released. In that instance, the Host Customer must apply for a new incentive reservation should the Host Customer still wish to participate in the Program.

4.3.2 Extending the Reservation Expiration Date

A request to extend the Reservation Expiration Date is limited to a maximum of 180 calendar days of additional time. Any request must include a written explanation of why the extension is required and how much additional time is needed. Approval of a request for a change in Reservation Expiration Date will not change or modify any other reservation condition. Failure to submit the Incentive Claim Form package by the original or extended Reservation Expiration Date will result in a cancellation of the application. The Applicant should submit a time extension request in writing to the Program Administrators. In describing the reason for the time extension request, the Applicant should provide information on the following to aid the Program Administrators in their decision on granting an extension:

1. Circumstances were beyond the control of the reservation holder that prevented the system from being installed as described in the Reservation Request Package. Describe the need and reasons for the request.
2. If there was a problem in the permitting process and it was the cause of delay, provide documentation, such as any correspondence with the building department, to support this explanation.

3. Cost documentation must demonstrate that the system purchaser has incurred substantial costs toward the reserved system's total purchase price. Attach copies of paid invoices, checks or other verifying documentation with the extension request.
4. Documentation of any equipment installed at the Site.

In order for any Project to receive a Reservation Extension, the Applicant may need to show documentation of a purchase order or commitment from a PV panel manufacturer to supply the necessary equipment.

The Program Administrator reserves the right to perform a Site inspection to verify the status of the Project installation prior to granting the request for extension. If required, the Program Administrator shall notify the Applicant and schedule the Site visit within 10 days of notification.

4.3.3 Transfer of Reservation from one Site to Another

Host Customers should contact their Program Administrator as soon as they realize a Reservation Transfer is necessary. A request to transfer a MASH Reservation from one Site to another within a single utility service territory may be considered in accordance with the following provisions:

1. Reservation Transfer requests must be made within 180 days of the initial Reservation Notice. Projects are not eligible for a Reservation Transfer after this time.
2. In order to transfer a Reservation, Host Customers must demonstrate to their Program Administrator that they have spent a non-negligible amount of money on Project development at the first Site reserved, and must provide documentation proving that this first site is not viable for solar Project development.
3. Host Customers must provide documentation and demonstrate to their Program Administrator that the second Site, to which the application will be moved, is viable for solar Project development.
4. A Reservation may only be transferred once.
5. Reservations can only be transferred to another Site within the same Program Administrator service territory.
6. Transferred Reservations that increase overall capacity following the Reservation Transfer are eligible to receive MASH incentives for additional capacity only at the current Incentive levels in that service territory and subject to other Handbook provisions on system up-sizing. The original Reservation cannot be changed with respect to the amount of capacity that is eligible for MASH incentives. This means that if Incentive levels decline between the time of the initial Reservation and when the Reservation Transfer occurs, any capacity in excess of the initial Reservation will be reserved at a lower (i.e., the current) Incentive level, if it is eligible.
7. Once a Reservation Transfer has been confirmed, the Project timeline resets as per the date of the Reservation Transfer and the Project will be eligible for the full implementation time allowed to their Project class (residential, commercial or government and non-profit) in the Handbook.
8. Generally, once the initial reservation has been issued, the application fee becomes non-refundable.

4.4 Incentive Payment Process

Once a Project is completed, Applicants may request payment of the MASH incentive amount listed on their Incentive Claim Form. A Project is considered completed when it is completely installed, interconnected, permitted, paid for, and capable of producing electricity in the manner and in the amounts for which it was designed.

To receive the MASH incentive, all MASH Program requirements must be met and a complete Incentive Claim Form package submitted prior to the Reservation Expiration Date. Applicants are advised to keep a copy of the Incentive Claim Form package along with all required documentation for their records. The Application Process sections and Section 4.1 contain more detailed information on the Incentive Claim Form package and submittal process. The Program Administrator processes completed Incentive Claim Form packages on a first-come, first-served basis.

The Program Administrator reserves the right to withhold final MASH incentive payment pending review and approval of the incentive claim documentation and field inspection results.

4.4.1 Incomplete Incentive Claim Form Packages

If an Incentive Claim Form package is incomplete or is found to require clarification, the Program Administrator will request the information necessary to process that application further. Applicants have 14 calendar days to respond to the requested clarification with the necessary information.

If after 14 calendar days, the Applicant has not submitted the requested information, the request for payment may be denied.

If an Incentive Claim Form package is not received by the expiration date of the Incentive Claim Form, or the Incentive Claim Form package indicates that the Project is otherwise ineligible, the Program Administrator will send a written notice stating the reasons why the Project is ineligible and the Project will be rejected. If this is the case, the Applicant or Host Customer may reapply for a MASH incentive reservation but will be subject to the eligibility requirements, incentive levels, and funding available at that time of reapplication.

4.4.2 Incentive Check Payment and Terms

Upon final approval of the Incentive Claim Form documentation and completed field verification visit (if required), the Program Administrator will issue the MASH incentive payment. Payment will be made to the Host Customer or a third party as indicated on the Incentive Claim Form, and will be mailed to the address provided. In cases where the contractor is the designated payee but the license is expired or suspended, see section 2.1.4.1 for the payee designation process. As the reservation holder, the Host Customer may assign payment to a third party on the Incentive Claim Form. The payee must submit their tax ID number and tax status to the Program Administrator.

4.4.2.1 Expected Performance Based Buydown (EPBB) Incentive Payment Terms

MASH projects will receive an EPBB Incentive. The EPBB incentive will be a one-time lump sum payment to help reduce the cost of installing a residential PV system. Upon final approval of the Incentive Claim Form package and completed field inspection visit, if applicable, the Program Administrator will issue the MASH incentive in approximately 30 days.

The EPBB payment shall be calculated according to Section 3.2 and noted on the Incentive Claim Form, provided no adjustments to the system size or estimated output are warranted after system inspection.

Please review Section 4.5 for information on potential system size changes affecting the incentive amount.

The lump sum EPBB Incentive payment issued constitutes final and complete payment.

4.5 System Changes Affecting Incentive Amount

The Program Administrator will expect a system to be installed as described in the Reservation Request Package. However, it is recognized that changes may occur during installation and that changes may be necessary in some circumstances.

If the installed system is smaller in output than specified in the Reservation Request Package or Proof of Project Milestone, the incentive amount will be calculated using the installed system size. If the installed system is larger than that originally specified in the Reservation Request Package or Proof of Project Milestone the incentive may be recalculated based upon the installed system size, if funding is available.

If the increase in size occurs after the expiration date of the Confirmed Reservation, the incremental addition will be considered a new project and must submit a Reservation Request with its required documentation.

If the installed system changes or an increase to the system is made after the Incentive Claim approval, the new system size and equipment must be reported to the Program Administrator and utility interconnection departments. System size changes including equipment and design that are greater than or equal to 1 kW CSI AC may apply for a MASH incentive if all eligibility requirements are met. The Applicant, System Owner, or Host Customer must notify PAs via email if there is a system increase of any size due to a design factor change. Please reference Section 1.4 for PA contact information. Failure to do so may result in an Applicant and/or Contractor failure.

If the entire available budget for a Program Administrator is reserved for other projects and there is no available funding, the Program Administrator cannot increase the reserved incentive amount.

Please review Section 3.1.1 for information on the application process should the calculator change.

4.6 MASH Project Review

It is the intent of the MASH Program to provide incentives for reliable, permanent, and safe solar energy systems that are professionally installed in compliance with all MASH Program Handbook rules, as well as all applicable federal, state, and local regulations.

Program Administrators will conduct a MASH Project Review to verify that each project is installed as represented in the Incentive Claim Documentation and to ensure that the Host Customer and Applicant have complied with all MASH Program Handbook requirements.

Among the components of the MASH Project Review are:

- Onsite field inspections, including verification of MASH application information and/or metering inspections (if applicable)
- Application process review, including:
    - Review of all project application documentation
    - Review of interconnection information
    - Review of any other information about the Applicant's project that has been received by the Program Administrators

The results of the MASH Project Review process may affect project incentive payments and eligibility for future program participation.

First, the MASH Project Review process will determine whether a specific project should be paid incentives under the MASH program. The incentive payment will be contingent on and may be adjusted based on any aspect of the MASH Project Review, including applicable onsite field inspections. If an issue arises during the MASH Project Review, the Applicant, Solar Contractor, System Owner, Seller, and/or Host Customer may have the opportunity to correct the problem. However, if an issue arises during the onsite field inspection, the project is subject to the results of the inspection.

Second, the MASH Project Review process may also determine whether an Applicant, Solar Contractor, System Owner, Seller, and/or Host Customer are subject to the consequences for failures and/or immediate disqualification from participating in the MASH Program as provided in Sections 4.7.

The Program Administrator will notify the Applicant, Solar Contractor, System Owner, Seller, and/or Host Customer if the MASH Project Review will result in a change in system size and/or incentive amount due to failure or immediate disqualification as provided in Section 4.6.2.

4.6.1 Onsite Field Inspections

All MASH systems will receive an onsite field inspection.

It is recommended, but not required, that the Applicant attend the inspection. If neither the Applicant nor the Host Customer will be present during the inspection, the inspector must obtain permission from the Applicant or Host Customer to perform the inspection.

4.6.1.1 Key Project Components Reviewed During Onsite Field Inspection

The inspectors will verify the System is installed in accordance with information provided on the Incentive Claim documentation, and in compliance with MASH handbook rules.

The following are some examples of what will be inspected and verified:

Modules and Inverter(s)

- Manufacturer
- Model Number (if model nameplate is not visible, invoice is necessary for verification)
- Quantity

Installation Parameters

- Tilt
- Azimuth
- Standoff Height
- Shading of Array(s)
    - The Program Administrators reserve the right to ask for a shading study from an Applicant. Shading studies will generally be requested for projects that do not meet the minimal shading requirements

Operation

- System is operational, and output is reasonable for conditions at the time of the inspection

PMRS Meter or Metering Related Equipment

- The metering equipment must meet the requirements as outlined in Sections 5.1 and 5.2.

4.6.1.2 Acceptable Range of Parameters for Key Project Components Reviewed During Inspection

The onsite field inspector will review and record key project components found at the installation site. The Program Administrators will evaluate and compare the results of the inspection to the Incentive Claim documentation.

The inspection results must fall within the following tolerances to pass inspection:

- Tilt ± 3º
- Azimuth ± 5º
- Summer Shading (May-October) ± 5%

A new EPBB Calculator will be run and the project incentive modified accordingly if:

- The onsite field inspection results are outside of the above tolerances, or
- The onsite field inspection reveals other discrepancies between key project components and the project's Incentive Claim documentation.

If applicable, an infraction or failure as defined in Sections 4.6.2.1 and 4.6.2.2 will be issued to the appropriate party if the incentive identified on the original Incentive Claim Form is 5% greater or below the incentive amount resulting from the onsite field inspection. All project incentives are subject to the results of the onsite field inspection.

The Program Administrator will notify the Applicant, Solar Contractor, System Owner, Seller, and/or Host Customer if an onsite field inspection will result in a change in system size and/or incentive amount.

4.6.2 Infractions and Failures

A project can receive an infraction or failure based on the MASH Project Review or the onsite field inspection.

4.6.2.1 Issuance of Infractions

An infraction can be issued to the Applicant, Solar Contractor, System Owner, and/or Host Customer for the following reasons but are not limited to:

- The incentive amount submitted in the incentive claim documentation differs from that of the onsite inspection incentive results between 5-10%
- Neglecting to provide required documentation on a consistent basis, such as Host Customer contact information
- Neglecting to respond to requested information within the 14 day time period on a consistent basis
- Failure to include System Owner on high-level service notification alerts indicating a non-functioning or poorly functioning system.

4.6.2.2 Issuance of Failures

A failure can be issued to the Applicant, Solar Contractor, System Owner, and/or Host Customer for the following reasons but are not limited to:

- The incentive amount submitted in the incentive claim documentation differs from that of the onsite inspection incentive results greater than 10%
- 3 Infractions as defined in section 4.6.2.1
- Re-inspections (due to contested result) found to have adjustments made to match the original submission following the initial inspection
- Re-inspections (due to contested result) found to have the same results as the original inspection

- System is found non-operational at the time of inspection due to equipment failure
- Installation of PV modules, inverters and/or performance meters not on the CEC's list of eligible equipment or otherwise ineligible for incentives
- Failing to disclose the actual contractor performing work on Installation Contract
- Failure to notify the Program Administrator of a system addition of any size after an incentive has been issued.

4.7 Notifications, Sanctions and Dispute Resolution

The MASH Program has two classifications for Applicants, Solar Contractors, System Owners and Sellers for the purposes of determining probation and/or program removal based on failures:

1. High volume Applicant, Solar Contractor, System Owner and Seller is defined as having had 20 or more projects completed within the previous 12 month rolling period
2. Low volume Applicant, Solar Contractor, System Owner and Seller is defined as having less than 20 projects completed within the previous 12 month rolling period

For high volume Applicants, Solar Contractors, System Owners and Sellers:

- Probation status will be applied if five completed projects within the previous 12 month rolling period have received failures.
- Removal from MASH Program will be enforced if seven completed projects within the previous 12 month rolling period have received failures.

For low volume Applicants, Solar Contractors, System Owners and Sellers:

- Probation status will be applied if two failures were received within the previous 12 month rolling period.
- Removal from MASH Program will be enforced if three failures were received within the previous 12 month rolling period.

If an Applicant, Solar Contractor, System Owner and/or Seller is placed on probation, they will remain under that status for a period of one year.

4.7.1 Grounds for Immediate Disqualification from the MASH Program

An Applicant, Solar Contractor, System Owner, Seller, and/or Host Customer may be immediately disqualified from participating in the MASH program if any of the following events occur:

- A Solar Contractor that operates under a false CSLB license number or another contractor's CSLB license number

- An applicant fails to disclose another funding sources (See Section 3.3) that materially affects the project's qualification for the MASH incentive
- The onsite field inspection results in an incentive amount that is 25% above the original Incentive Claim Form Incentive amount, or:
- The Solar Contractor installs used or stolen PV modules and/or any other system components
- Forged paperwork
- Providing any false information to the Program Administrator or any MASH program participant (Applicant, Solar Contractor, System Owner, Seller and/or Host Customer)

4.7.2 Notifications and Sanctions

The Program Administrator will notify the Applicant, Solar Contractor, System Owner, Seller, and Host Customer if the Program Administrator determines that an infraction or failure has occurred.

If a MASH project results in the imposition of an infraction or failure on an Applicant, Solar Contractor, System Owner, Seller and/or Host Customer, the Program Administrator will notify all of the related entities on the project application of the reasons for the determination.

Once notified of an infraction or failure due to an onsite field inspection or the application process review, the Applicant, Host Customer, or System Owner will either accept the results or dispute the results through the dispute resolution section found in Section 4.7.4.

4.7.3 Process for Removal from the MASH Program

4.7.3.1 **Removal from Program for Excessive Failures**

If it is determined that an Applicant, Solar Contractor, System Owner, Seller, and/or Host Customer is immediately disqualified from participating in the MASH program because of more than the acceptable number of failures based on the company's size pursuant to Section 4.7 then the Program Administrator will:

- Withholding confirmation of all projects in the Reservation Request Review and Suspended Reservation Request Review status;
- Pay MASH incentive payments only for Reservations Confirmed before the date of the disqualification;
- Notify all parties identified on the application will be notified of the disqualification.
- Allow completion and payments of only pending applications of the entity being disqualified if no grounds for immediate disqualification exist under Section 4.7.1.

Disqualified parties who are allowed to reenter the MASH Program will be placed on probation status after the designated removal period is complete and must send a written notification to the Program Administrators explaining in detail what actions were taken to reduce future failures and to ensure future program compliance. The notification must be received by the Program Administrators within 30 days prior to reentry into the MASH Program.

4.7.3.2 Removal from Program for Immediate Disqualification

If an Applicant, Solar Contractor, System Owner, Seller, and/or Host Customer is immediately disqualified due to the reasons pursuant to Section 4.7.1, the following will occur:

- Projects in the Reservation Request Review and Suspended Reservation Request Review status will not be Confirmed and all applications associated with the entity being disqualified will be suspended;
- No MASH incentive payment will be made to the entity that has been immediately disqualified; and
- All parties identified on the application will be notified of their application's status.

If the Solar Contractor is disqualified from participating the MASH Program due to the reasons outlined in Section 4.7.1 and if the system has not yet been installed, the Host Customer may hire a new Solar Contractor without losing the existing incentive reservation and may apply for an extension, if necessary.

4.7.3.3 Contractor Suspension due to CSLB License Suspension

See Section 2.1.4.1 for information about the process that will be followed if a CSLB license is suspended while a contractor still has active projects.

4.7.4 Dispute Resolution

The Applicant, Solar Contractor, System Owner, Seller, and/or Host Customer may appeal in writing to the Program Administrator's regarding notification of sanction. To appeal the notification, the disqualified entity must first contact the appropriate Program Administrator within 30 days to discuss the issue. If the disqualified entity has new information to provide the Program Administrator, then it must be provided to the Program Administrator within 30 days. If the disqualified entity and the Program Administrator cannot resolve the dispute, then the disqualified entity can file a complaint using the California Public Utility Commission's (CPUC's) Formal Complaint process. Information on the formal Complaint process is available through the Public Advisor's Office at the CPUC or on CPUC's website: www.cpuc.ca.gov.

4.8 Expended Budget Guidelines

4.8.1 Wait List

Once the incentive funding becomes expended in a Program Administrator's territory, the Program Administrator may be unable to guarantee a MASH incentive. A Wait List will be created for all unreserved applications.

The wait list includes the following information:

Ranking—The position of each project on the wait list is ranked according to the date and time it is received. For example, the project that is ranked number one on the wait list will be the first to receive an incentive reservation when funding becomes available.

Application Number—The number assigned to an application (XXX-MASH-XXXXX) once it has been submitted online through PowerClerk with all required documents.

MASH System Size—The maximum system size (kW) that will be incentivized upon reservation.

Current Status—the status of the project in PowerClerk. This status will remain as "Wait List" until the Program Administrator has sufficient funding.

Date and Time of Submittal—The time that the project application was received online through PowerClerk. This is an extremely important number because it defines the criteria for chronologically ranking projects on the Program Administrators Wait List.

4.8.2 Wait List Process (For Wait Listed Projects and New Projects received after January 30, 2015)

- Applicant completes and submits the MASH application online. All required documents must be attached and all sections of the applications must be completed via PowerClerk.
- Applicant receives a MASH number (XXX-MASH-XXXXX) and the project will be ranked on the "Wait List" in PowerClerk. The project's ranking on the wait list can be found on the Program Administrator's website.
- As funding becomes available, the Program Administrator will review each project in the order it is ranked. At that time, the Program Administrator will invoice the Host Customer for the applicable application fee for MASH projects, which must be paid within 30 calendar days of invoicing. If the application fee is not received within this period, the application will be cancelled and removed from the wait list. In this instance, the next project on the wait list will be moved to the "Reservation Request Review" status. In addition, applications that require follow up information will be suspended and will be given 14 calendar days to submit the requested information. If the required documentation is not submitted within 14 calendar days, the application will be cancelled. All suspension and application fee deadlines will be strictly enforced.
- Upon receipt of the application fee and approval of the application, the project will receive its initial reservation.
- New applications submitted to PowerClerk after the re-opening of the program will receive a date and timestamp along with a project number (XXX-MASH-XXXXX). New applications will be queued in order based on the date and timestamp.

4.8.3 Wait List Process (Wait Listed Projects received prior to January 30, 2015)

- All MASH projects on the wait list prior to January 30, 2015 will be moved to the new MASH PowerClerk 1C/1D application.

- MASH projects that were installed and interconnected prior to January 30, 2015 decision date are eligible for 1C and/or 1D incentives. These projects must meet all of the specified requirements outlined in this Handbook.

- Applicant will be notified by Program Administrator that the wait listed project has been moved to New Reservation Review. The applicant will then have 30 calendar days from the date requested by the PA to provide documentation meeting the new program requirements and update the MASH application with the applicable Track 1C/1D allocation percentage. See Section 4.2 for details regarding Application Documentation. If the required documentation is not submitted within 30 calendar days, the application will be canceled.

- Applications that require follow up information after the initial 30 calendar days will be suspended and will be given an additional 10 calendar days to submit the required documentation. If the required documentation is not submitted within 10 calendar days, the application will be canceled. Once an application moves forward beyond the waitlist process outlined in this section, the application will follow the standard MASH application due dates detailed in this Handbook.

- The Program Administrator will invoice the Host Customer for the applicable application fee for the MASH project, which must be paid within 30 calendar days of invoicing. If the application fee is not received within this period, the application will be cancelled. Once an application is cancelled, the next project on the wait list will be moved to Reservation Request Review 1C/1D status.

4.8.4 System Size Increase

If the incentive budget funds are expended in a particular PA service territory, the incentive amount per application will be capped at the reserved amount in Step 1 (Reservation Request step). System modifications resulting in an increase in the incentive amount during the PPM or ICF step will not be paid. Once the Track 1D 80% incentive budget cap is met per Program Administrator service territory, all other reservations will be limited to Track 1C incentive funding.

TECHNICAL SECTION

5. Metering Requirements

This section contains detailed information on the minimum metering and monitoring requirements for participation in the MASH Program. These minimum metering requirements were developed to increase owner knowledge of system performance, foster adequate system maintenance, and thereby ensure ratepayer-funded incentives result in expected levels of solar generation.

Table 8
Metering and Reporting Summary[1]

Incentive Structure	System Size	Minimum Meter Accuracy	PMRS Required[3]
EPBB	≤ 10 kW	± 5%	No
EPBB	> 10 kW	± 5%	Yes

Table 8 Notes:

1) All metering systems are paid for at the System Owner's expense including some form of communications, performance monitoring and reporting capability.
2) System performance data is required to be submitted to the Program Administrator based on the terms and requirements of the measurement and evaluation program in section 2.12.

All System Owners are responsible for the choice and installation of the metering hardware as well as the selection of a PMRS provider. The System Owner is also responsible for resolving any issues relative to PMRS performance data.

PMRS is required for all projects greater than 10 kW; however, exemptions are allowed for MASH projects provided the cost of the PMRS exceeds the program cost limits (see Section 4.1.2). It is the responsibility of the System Owners to contract with a PMRS provider for a minimum of five years and ensure that 15 minute interval production data is provided to the Program Administrator quarterly for five years. The Applicant must submit the name of the PMRS provider on the Incentive Claim Form. While it is not a requirement to provide the PAs with the PMRS contract in the Incentive Claim package, the System Owner must submit the current PMRS contract if requested by the Program Administrators. If the five year PMRS contract is not submitted at the request of the Program Administrator, all incentives will be placed on hold.

The list of eligible PMRS providers may be found on the Go Solar CA website:
http://www.gosolarcalifornia.ca.gov/equipment/perf_monitor.php

Detailed information on these summarized requirements follows.

5.1 EPBB Metering Requirements

All systems receiving an EPBB incentive must install a solar energy production meter accurate to within ± 5% of actual system output.

Other solar electric generating technologies displacing thermal system Btu meter(s) must be accurate to +/- 5%.

5.1.1 Contract for PMRS Service

PMRS is required for systems greater than 10 kW receiving an EPBB incentive. See section 5.4 for minimum PMRS service requirements. If PMRS is purchased for a system receiving an EPBB incentive, and the system is less than or equal to 10 kW, the PMRS provider and performance meter information must be disclosed on the Incentive Claim Form.

If PMRS is required and purchased for the solar system, the System Owner must contract for the services. A contract will not be required to submit for PA review, but the PMRS provider name must be listed on the Incentive Claim Form. The PA reserves the right to request a copy of the contract if needed. See Section 4.1.2 for more information on PMRS requirements.

5.2 Minimum Metering Equipment Requirements

All systems must be installed with a meter or metering system which allows the System Owner and Program Administrator to determine the amount of system energy production and allows the System Owner to support proper system operation and maintenance. The meter must be listed with the California Energy Commission and must meet the minimum meter requirements of this section.

The California Energy Commission's list of qualifying meters may be found at: http://www.gosolarcalifornia.ca.gov/equipment/system_perf.php

5.2.1 Meter Type

5.2.1.1 **EPBB**

Installed meter(s) for systems receiving an EPBB incentive do not need to be separate Interval Data Recording (IDR) meter(s) and may be internal to the inverter(s) only if they are exempt from the PMRS requirement.

5.2.2 Meter Accuracy

All systems receiving an EPBB incentive must install a solar energy production meter accurate to within ± 5% of actual system output.

5.2.2.1 **EPBB Meter Accuracy and Frequency of Data Collection**

All systems receiving an EPBB incentive must install a solar energy production meter accurate to within +/-5% of actual system output. The PMRS must remotely acquire and process all data points no less frequently than once every 15 minutes.

5.2.3 Meter Data Access

All meters must provide the PMRS provider with the ability to access and retrieve the minimum required Solar Performance / Output Data from the.

5.2.4 Meter Display

All meters must provide a display showing the meter's measured net generated energy output and measured instantaneous power. This display must be easy to view and understand. This display must be physically located either on the meter, inverter, or on a remote device.

5.2.5 Meter Memory and Storage

All meters must have the ability to retain collected data in the event of a power outage. Meters that are reporting data remotely must have sufficient memory to retain 60 days of data if their standard reporting schedule is monthly and 7 days of data if their standard reporting schedule is daily. Meters that are not capable of remotely reporting their data, must retain 90 days of data in support of quarterly reporting. In all cases lifetime production data must be stored.

5.3 Minimum Communication Requirements

All systems must be installed with some form of communication capability that will provide meaningful feedback to System Owners and Program Administrators. The systems should have remote communicating capability whereby performance data can be collected, accessed remotely, and uploaded for processing by a PMRS. For systems receiving an EPBB Incentive that are unable to meet the cost cap, the meter display must be accessible to the System Owner, and the Program Administrator must be provided means to retrieve and collect performance data.

5.3.1 Data Privacy

Protecting the privacy of System Owners and Host Customer is of the highest order. As such, data shall be collected, processed, and reported to the System Owner and the Program Administrator in accordance with this Section. The PMRS may provide data to third parties, including Solar Contractors and Host Customers (if different than the System Owners), provided the System Owner has consented in writing to the release of such performance data.

5.4 Minimum Performance Monitoring & Reporting Capability Requirements

In order to enable System Owners to properly maintain and evaluate the performance of their systems and to allow Program Administrators to monitor the performance of systems receiving

MASH incentives, the System Owner must contract with a PMRS provider in order to monitor and report on the minimum data points and all monitoring, data collection, data retention, and reporting must be performed as specified in the corresponding sub-sections below.

5.4.1 Minimum PMRS requirements for EPBB systems

- ±5 % meter
- Data as collected and summarized by hour, day, month, and year.
- Provide System Owner with on-demand access to all reports required by Section 5.4
- Notification service alerts to the System Owner indicating a non-functioning or poorly functioning system
- Quarterly 15 minute interval kWh energy production data submittals to Program Administrator or its designee[24] for 5 years
- Listed on the California Energy Commission Eligible PMRS Provider list

5.5 Advanced Metering Infrastructure (AMI) Coordination

To the extent AMI coordination is an important component of EBPP program administration, the Commission will re-evaluate the requirements of this section at that time.

5.6 MASH Program Administrator Liability

The Program Handbook defines the criteria required for PMRS providers to participate in the Program only.

[24] The entity currently under contract with the Program Administrators for collection of EPBB data is Itron, Inc. EPBB project data can be sent to solardata@itron.com. All PRMS providers will be notified if there is a change in this contact information.

6. Equipment Certification, Rating Criteria & Design Factor Calculations

6.1 Equipment Certifications and Rating Criteria

PV system components (modules, inverters, and system performance meters) must be certified through the California Energy Commission's PV system certification program. The CEC provides a list of currently certified eligible equipment on the Go Solar California site at http://www.gosolarcalifornia.ca.gov/equipment/ or through its Call Center: (800) 555-7794.

The Program Administrators will confirm that equipment identified in the Reservation Request Package meets eligibility requirements prior to providing a Confirmed Reservation Notice. As described in Section 2.2.1, an exception may be made for new equipment that has not yet received certification but for which the certification process has been initiated. Equipment is periodically added and removed from the lists of eligible equipment, so Applicants should confirm that the components purchased for a system are eligible prior to installation. Equipment must be certified before any incentive payments will be made.

Eligibility requirements for components are summarized below:

- PV modules must be listed on the California Energy Commission's Eligible Equipment List
- Inverters must be listed on the California Energy Commission's Eligible Equipment List
- Meters:
  - Inverter Integrated: must be tested in accordance with Appendix C-3
  - External meters must be listed on the California Energy Commission's Eligible Equipment List

6.2 Design Factor Calculation: Expected Performance Based Buydown (EPBB) Incentive

The Program Administrators will use the California Energy Commission's CEC-AC method to determine the system rating. The following formula determines the EPBB incentive:

EPBB Incentive Payment = Reserved Incentive Rate x System Rating[25] x Design Factor

The Design Factor is a ratio comparing a proposed system to a reference system. Very simply, it reflects:

$$\text{Design Factor} = \frac{\text{Proposed System}}{\text{Reference System}}$$

[25] CEC-AC System Rating (kilowatts) = Quantity of Modules x CEC Rating of Photovoltaic Modules x CEC Inverter Efficiency Rating / 1000 (watts/kilowatt)

More specifically, the Design Factor is calculated as follows:

DF = Dcorr * Gcorr * Icorr

Dcorr (Design Correction) = Ss,p,p / Ss,p,o

Ss,p,p = The system's estimated summer kWh output at the proposed location, with proposed tilt & azimuth

Ss,p,o = The system's estimated summer kWh output at the proposed location, with summer optimized tilt & azimuth allowing for equal treatment of proposed systems oriented from South to West (i.e., the optimized system's orientation shall be the same as the proposed system for orientations due south to due west).

Gcorr (Geographic Correction) = As,p,o / As,r,o

As,p,o = The system's estimated annual kWh output at the proposed location, with summer optimized tilt & south azimuth

As,r,o = The system's estimated annual kWh output at the reference location, with summer optimized tilt & south azimuth

Icorr (Installation Correction) = PTCadj / PTC

PTCadj = The adjusted PTC DC rating accounting for mounting method, NOCT and power temperature coefficient for that specific module.

PTC = The DC rating of the panels at PVUSA Test Conditions.

In sum, the Design Factor for EPBB will:

- Treat all systems oriented between 180º and 270º equally
- Assign optimal orientation tilt for each compass direction in range of 180º and 270º, optimized for summer production
- Include location-specific criteria to account for weather variation and shading
- Be based on an optimal reference system and location
- Determine optimal reference latitude tilt that relate to local latitude

Please refer to the EPBB User Guide for more detailed explanation of the calculator's methodology and instructions, at www.csi-epbb.com.

7. Field Verification

The Solar Contractor must perform field verification prior to submission of the Incentive Claim Form, following the guidelines below:

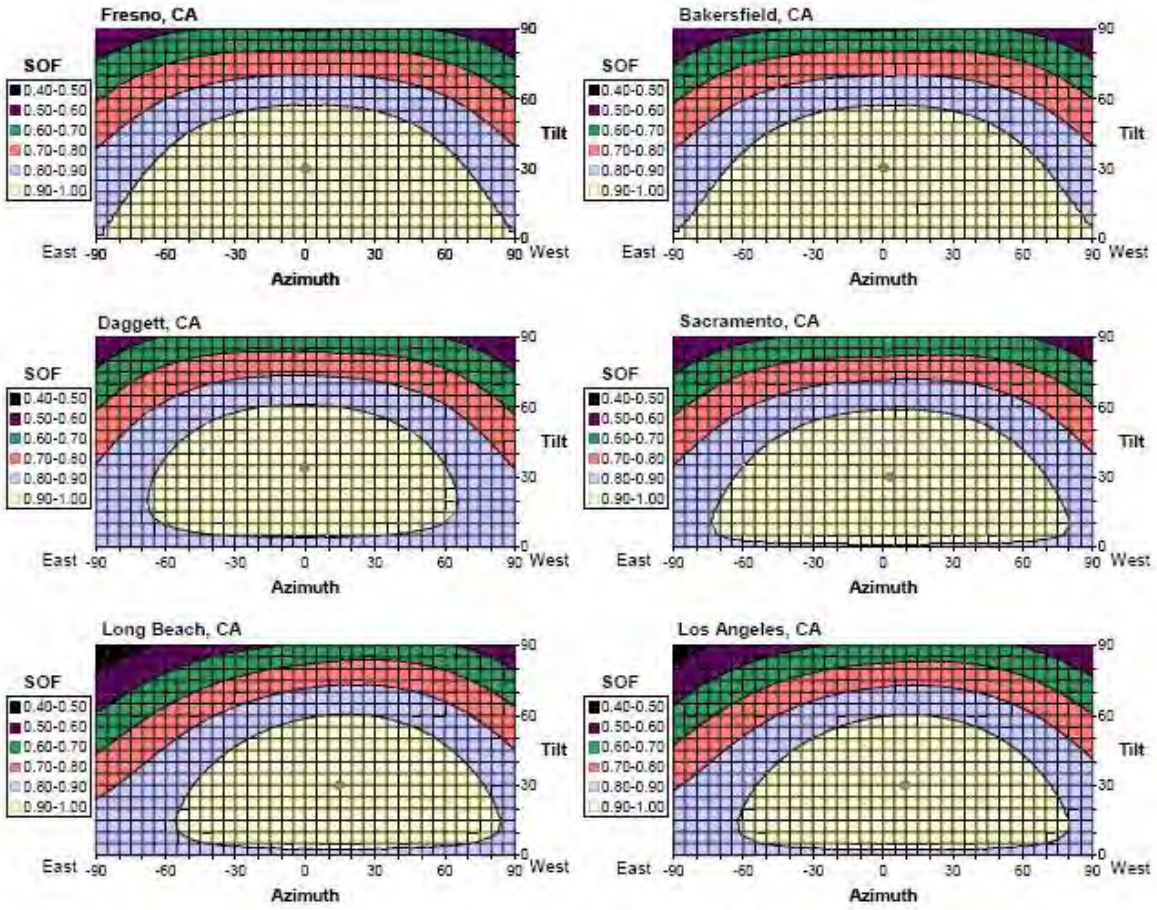
1. Measure Solar Irradiance: Solar irradiance shall be measured using an irradiance meter. When making this measurement, the Solar Contractor or verifier shall place the irradiance meter in a plane that is parallel to the PV modules. The Solar Contractor should position the irradiance meter on top of the PV modules or on the roof next to the PV modules. If the verifier is not able to get on the roof, he or she shall position the irradiance meter such that it is in full sun and is in plane that is parallel to the PV modules. Digital protractors or other instruments may be used to position the irradiance meter properly.
2. Measure Temperature: Ambient air temperature shall be measured with a digital thermometer in the shade. The instrument shall have an accuracy of ± 2° C.
3. Index Irradiance and Temperature on the Field Verification Output Table (available on Program Administrator websites) to determine performance percentage.
4. Multiply performance percentage times CEC-AC wattage of the array to determine minimal acceptable system performance.
5. Observe and Record actual output as shown on the PV system's meter. The inverter may cycle between multiple readings (total kWh of production, AC power output, etc.), so the Solar Contractor or verifier will need to wait until the power is displayed and record this reading; several readings should be made to make sure that they are consistent and stable.
6. Properly functioning systems will have actual outputs higher than the minimal acceptable system performance.

Note: ensure all values are in watts or kilowatts depending on the readout of the meter.
Exception: Systems with two or more strings with the same tilt and azimuth connected to the same inverter may do the following instead:

a. Complete a visual check of the system to ensure the modules and all other system components are bolted securely, and all wiring connections have been made properly according to the system schematic, manufacturer's instructions, and applicable electrical code requirements.
b. Check the polarity of all source circuits to be correct.
c. The open circuit voltages of source circuits shall be tested and measured to be within 2 percent of each other.
d. The short circuit currents shall be tested and measured to be within 5 percent of each other.

For Multiple Orientation Arrays:
Multiple orientation arrays are those with parallel strings, each with an equal number of modules, in different orientations (azimuth and tilt) connected to the same inverter. When parallel strings in different orientations are connected to the same inverter, each orientation and solar irradiance shall be measured separately in a plane parallel to each orientation. The expected AC power output is determined separately for each orientation and the sum is used for verification purposes.

8. Surface Orientation Factors for California Locations[26] [27]



[26]Surface Orientation Factor plots provided courtesy of Craig Christensen, Principal Engineer, National Renewable Energy Laboratory.

[27]SOF plots for coastal California locations show the optimal azimuth to be somewhat west of south (presumably due to morning fog in those locations). It is important to remember that this is a temporal effect (foggy skies in the morning when the sun is to the east, clear skies in the afternoon when the sun is to the west).

9. Acronyms

This section provides a list of acronyms used in this Program handbook.

AB (as in AB 1407, AB 2466, AB 2724, etc.): Assembly Bill

AC: Alternating Current

AMI: Advanced Metering Infrastructure

BIPV: Building Integrated Photovoltaic

BTU: British Thermal Units

CCA: Community Choice Aggregator

CSE: Center for Sustainable Energy

CEC: California Energy Commission

CEC-AC: California Energy Commission Alternating Current, refers to inverter efficiency rating

CPUC: California Public Utilities Commission

CSI: California Solar Initiative

CSLB: Contractors State License Board

DC: Direct Current

ERP: Emerging Renewables Program

EPBB: Expected Performance-Based Buydown

ESA: Energy Savings Assistance

ESCO: Energy Service Company

IDR: Interval Data Recorder

IOU: Investor-Owned Utility

KW: Kilowatt

KWH: Kilowatt-hour

LIEE: Low Income Energy Efficiency

MASH: Multifamily Affordable Solar Housing

M&E: Measurement and Evaluation

M&V: Measurement and Verification

MW: Megawatt

NABCEP: North American Board of Certified Energy Practitioners

NEM: Net Metering

NEMA: NEM Aggregation pursuant to a utility NEM tariff

NRTL: Nationally Recognized Testing Laboratory

NSHP: New Solar Homes Partnership

PBI: Performance-Based Incentives

PDP: Performance Data Provider

PG&E: Pacific Gas and Electric Company

PIER: Public Interest Energy Research

PMRS: Performance Monitoring and Reporting Service

PTC: PVUSA Test Conditions

PV: Photovoltaic

PY: Program Year

REN: Renewable Energy Network

SASH: Single-Family Affordable Solar Homes

SB (as in SB 1): Senate Bill

SCE: Southern California Edison Company

SDG&E: San Diego Gas & Electric Company

SGIP: Self-Generation Incentive Program

SOF: Surface Orientation Factor

STC: Standard Test Conditions

UL (as in UL 1703): Underwriters Laboratories, Inc.

VNM: Virtual Net Energy Metering

APPENDICES

Appendix A: Definitions

This section provides a list of definitions of key concepts used in this Program handbook.

AB 1407:
Assembly Bill 1407, codified as California Civil Code section 714, was signed by Governor Davis on September 3, 2003. Among other things, this legislation voids and makes unenforceable any existing covenant, restriction, or condition contained in any deed, contract, security instrument, or other instrument affecting real property, as specified, that prohibits or restricts the installation or use of a solar energy system, excepting provisions that impose reasonable restrictions on solar energy systems. This statute also mandates that whenever approval is required for the installation or use of a solar energy system, that such approval be processed in the same manner as approval of an architectural modification, and not be willfully avoided or delayed. Any Public Entity (see definition) may not receive funds from a state-sponsored grant or loan program, including the CSI, for solar energy if it fails to comply with these requirements. A Public Entity must meet these requirements to qualify for these grants or loans. Please see California Civil Code section 714 for full statutory requirements and further detail.

Alternating Current (AC):
Electric current that reverses direction, usually many times per second. Opposite of direct current (DC). Most electrical generators produce alternating current. Under the CSI Program, PV electric output calculations must always be made using the CEC-AC rating standards which include inverter DC to AC conversion losses.

Applicant:
The entity, either the Host Customer, System Owner, or third party designated by the Host Customer, that is responsible for the development and submission of the CSI application materials and the main point of communication between the CSI Program Administrator for a specific CSI Application.

Application Fee:
An Application Fee is required once the Reservation Request has been submitted for all non-residential projects greater than or equal to 10 kW. Where applicable, the Application Fee is a standardized amount based on system size criteria and is refundable, in general, when the Project is completed and the incentive is paid, or before the application receives the initial Reservation Notice.

Azimuth:
Azimuth is the horizontal angular distance between the vertical plane containing a point in the sky and true south. All references to azimuth within the CSI Program, unless expressly stated otherwise, refer to true, not magnetic, azimuth. For calculating an EPBB incentive, all proposed PV systems with a true azimuth orientation between 180 degrees and 270 degrees, facing south, southwest and west, will be compared to a reference system with the same orientation as the proposed system.

Backup Generators:
Backup generators operate as short-term temporary replacement for electrical power during periods of utility power outages. In addition to emergency operation they ordinarily operate for testing and maintenance. Backup generators do not produce enough power to be sold or otherwise supplied to the grid or provide power to loads that are simultaneously serviced by a utility electric grid. Backup generators only service customer loads that are isolated from the grid either by design or by manual or automatic transfer switch.

Benchmarking:
(as used herein): process that compares the energy use of the building to the energy use of a population of similar buildings.

British Thermal Units (BTU):
The amount of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit.

Building Integrated Photovoltaic (BIPV):
Building integrated PV systems are solar electric systems in which the PV panels constitute part of the building's roof or facade, replacing conventional building materials. For example, solar shingles may replace conventional asphalt shingles, providing roof protection while producing electricity.

Calendar Days:
All dates and schedules in the CSI are measured in calendar days, which include all days of the week.

Center for Sustainable Energy (CSE):
A Non-Profit 501(c)3 corporation that implements the CSI Program on behalf of SDG&E; formerly known as the San Diego Regional Energy Office.

California Energy Commission (CEC):
California's primary energy policy and planning agency. Created in 1974 and headquartered in Sacramento, the Commission has responsibility for activities that include forecasting future energy needs, promoting energy efficiency through appliance and building standards, and supporting renewable energy technologies. On August 21, 2006, the Governor signed Senate Bill (SB 1) which directs the CPUC and the CEC to implement the CSI Program consistent with specific requirements and budget limits set forth in the legislation.

California Public Utilities Commission (CPUC or Commission):
The CPUC regulates a number of industries including the electric utility industry that impact public well-being. Among other activities, the CPUC establishes service standards and safety rules and authorizes rate changes. The CPUC, in conjunction Senate Bill 1 (SB 1), has authorized the California Solar Initiative (CSI). In CPUC Decision (D.) 06-01-024, the California Public Utilities Commission (CPUC) established the CSI Program. In D.06-08-028, the CPUC established implementation details for the CSI Program.

California Solar Initiative (CSI):
The California Solar Initiative program pays incentives to solar photovoltaic (PV) projects in the three California IOU service territories. This Program Handbook is designed to describe the

requirements for receiving funding under the CSI. The program was authorized by the California Public Utilities Commission (CPUC) and Senate Bill 1 (SB 1). Responsibility for administration of the CSI Program is shared by Pacific Gas and Electric Company, Southern California Edison Company, and the Center for Sustainable Energy (CSE, formerly known as San Diego Regional Energy Office) for SDG&E customers.

Capacity Factor:
The ratio of the electrical energy produced by the generating system during a specific period, to the electrical energy the generating system could have produced if it had operated at full capacity rating during the same period.

Capacity Rating:
The capacity rating is a load that a power generation unit, such as a photovoltaic system, is rated by the manufacturer to be able to meet or supply. The Program Administrator will verify system capacity rating to confirm the final incentive amount.

CEC-AC Rating:
The CSI Program Administrators will use the California Energy Commission's CEC-AC method to measure nominal output power of photovoltaic cells or modules to determine the system's rating in order to calculate the appropriate incentive level. The CEC-AC rating standards are based upon 1,000 Watt/m^2 solar irradiance, 20 degree Celsius ambient temperature, and 1 meter/second wind speed. The CEC-AC Watt rating is lower than the Standard Test Conditions (STC).

Commercial:
Commercial entities are defined as non-manufacturing business establishments, including hotels, motels, restaurants, wholesale businesses, retail stores, and for-profit health, social, and educational institutions. For the purpose of CSI, commercial sectors include agricultural and industrial customers.

Contiguous Site:
An unbroken chain of adjacent parcels that are solely owned, leased or rented by the NEM customer. For the purposes of NEM Aggregation pursuant to a utility NEM tariff, parcels that are divided by a street, highway, or public thoroughfare are considered contiguous, provided they are within an unbroken chain of otherwise contiguous parcels and under the same ownership or lease, as verified in the Utility NEM Aggregation documentation.

Contractor:
A person or business entity who contracts to erect buildings, or portions of buildings, or systems within buildings. Under the CSI Program, all contractors must be appropriately licensed California contractors in accordance with rules and regulations adopted by the State of California Contractors State Licensing Board.

Contractors State License Board (CSLB):
Installation contracts for photovoltaic systems installed under the CSI Program must comply with the Contractors State License Board (CSLB) requirements. Please refer to the CSLB website for more information on CSLB guidelines at: www.cslb.ca.gov.

Design Factor:
The Design Factor is a ratio comparing a proposed system's expected generation output with that of a baseline system. The Design Factor is used in calculating the EPBB incentive (it is multiplied by the system rating and the incentive rate to determine EPBB incentives).

Direct Current (DC):
Direct current (DC or "continuous current") is the continuous flow of electricity through a conductor such as a wire from high to low potential. In direct current, the electric charges flow always in the same direction, which distinguishes it from alternating current (AC). Under the CSI Program, photovoltaic electric output calculations must always be made using the CEC-AC rating standards which include inverter DC to AC conversion losses.

Electric Utility:
The Host Customer's local electric transmission and distribution service provider for their Site.

Electrical Distribution Grid:
A network of power stations transmission circuits, and substations conducting electricity. Under the CSI Program, eligible renewable energy systems must be permanently interconnected and operating parallel to the electrical distribution grid of the utility serving the customer's electrical load.

Emerging Renewables Program (ERP):
The ERP is a California Energy Commission program offering cash rebates on eligible grid-connected renewable energy electric-generating systems.

Energy Service Company (ESCO):
A business entity that designs, builds, develops, owns, operates or any combination thereof self-generation Projects for the sake of providing energy or energy services to a Host Customer.

Energy Service Provider (ESP):
An entity that provides electric power and ancillary services (including but not limited to aggregators, brokers, and marketers, but excluding utilities) to an end use customer. Also referred to as an Electric Service Provider.

Expected Performance Based Buydown (EPBB):
The EPBB incentive methodology pays an up-front incentive to participants installing systems less than 30 kW in size that is based on a system's expected future performance. EPBB incentives combine the performance benefits of performance based incentives with the administrative simplicity of a one-time incentive paid at the time of project installation. The EPBB Incentive will be calculated by multiplying the incentive rate by the system rating by the Design Factor.

Firm Service Level:
Power supplies that are guaranteed to be delivered under terms defined by contract.

Fraud:
A knowing misrepresentation of the truth or concealment of a material fact to induce another to act to his or her injury.

Government:
A Government entity is any federal, state, or local government agency. Federal government entities include the Air Force, Army, Navy, Marines, Postal Service, General Services Administration, and all other Federal agencies or departments. State government entities include the University of California, California State University, Department of Corrections, Department of General Services, the combination of the Department of Developmental Services and CalTrans, the combination of the California Youth Authority and the Department of Mental Health, and all other state agencies and departments. Local government entities include cities, counties, school districts, and water districts.

Host Customer:
An individual or entity that meets all of the following criteria: 1) has legal rights to occupy the Site, 2) receives retail level electric service from PG&E, SCE, or SDG&E, 3) is the utility customer of record at the Site (GM CSI only) or owns the site, 4) property owner or persons/entity responsible for the building at the location where the generating equipment will be located (MASH only), 5) is connected to the electric grid, and 6) is the recipient of the net electricity generated from the solar equipment (GM CSI only).

Hybrid System:
A self-generation system that combines more than one type of distributed generation technology and is located behind a single Electric Utility service meter.

Interconnection Agreement:
A legal document authorizing the flow of electricity between the facilities of two electric systems. Under the CSI Program, eligible renewable energy systems must be permanently interconnected and operating in parallel to the electrical distribution grid of the utility serving the customer's electrical load. Portable systems are not eligible. Proof of interconnection and parallel operation is required prior to receiving an incentive payment.

Interval Data Recorder (IDR):
IDR is a metering device capable of recording minimum data required. Minimum data requirements include (a) hourly data required for the Direct Access settlement process; and (b) data required to bill the utility's distribution tariffs including 15-minute demand data--also referred to as Hourly Metering.

Inverter:
An electric conversion device that converts direct current (DC) electricity into alternating current (AC) electricity.

Inverter Efficiency:
The AC power output of the inverter divided by the DC power input.

Investor-Owned Utility (IOU):
For purposes of the CSI, this refers to Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company.

Kilowatt (kW):
A unit of electrical power equal to 1,000 watts, which constitutes the basic unit of electrical demand. The watt is a metric measurement of power (not energy) and is the rate (not the duration over which) electricity is used. 1,000 kW is equal to 1 megawatt (MW). Throughout this Program Handbook, the use of kW refers to the CEC-AC wattage ratings of kW alternating current inverter output.

Kilowatt Hour (kWh):
The use of 1,000 watts of electricity for one full hour. Unlike kW, kWh is a measure of energy, not power, and is the unit on which the price of electrical energy is based. Electricity rates are most commonly expressed in cents per kilowatt hour.

Lessor:
A person or entity who rents property to another under a lease. Under the CSI Program, in the case of a third-party owned system (or leased system, for example), the lessor is classified as the System Owner.

Load:
Either the device or appliance which consumes electric power, or the amount of electric power drawn at a specific time from an electrical system, or the total power drawn from the system. Peak load is the amount of power drawn at the time of highest demand.

Low Income:
Meets the definition of low income housing in Public Utility Code 2852 in order to apply for incentives through the MASH program. [28]

Maximum Site Electric Load:
The peak (maximum) kW demand at the Site, regardless if served by the existing generator, the local utility or a combination of the two.

Measurement and Evaluation (M&E):
A process or protocol to evaluate the performance of an energy system. As a condition of receiving incentive payments under the CSI Program, System Owners and Host Customers agree to participate in Measurement and Evaluation (M&E) activities as required by the CPUC. M&E activities will be performed by the Program Administrator or the Program Administrator's independent third-party consultant and include but are not limited to, periodic telephone interviews, on-site visits, development of a M&E Monitoring Plan, access for installation of metering equipment, collection and transfer of data from installed system monitoring equipment, whether installed by Host Customer, System Owner, a third party, or the Program Administrator.

Measurement and Verification (M&V):
A process or protocol to confirm the actual energy savings realized from a project once the project is implemented and operating.

[28] D.11-07-031 removed the two year occupancy permit requirement for low-income customers applying to the MASH program. Applicants for MASH must not have received incentives from the California Energy Commission's New Solar Homes Partnership.

Megawatt (MW):
Unit of electrical power equal to one million watts; also equals 1,000 kW.

Meter:
A device used to measure and record the amount of electricity used or generated by a consumer. The CSI Program requires accurate solar production meters for all solar projects that receive incentives. Systems receiving an EPBB incentive require a meter accurate to within ± 5%.

Metering System:
A metering system should include all distinct components necessary to measure the energy produced by a solar energy system. This must include equipment that allows the system to monitor and record 15-minute interval data either internally or externally through additional equipment such as a data logger. The system must include a 2% accurate meter either socket based or panel style allowing for a visual or remote display.

Minimal Shading:
No Solar obstruction is closer than a distance twice the height it extends above the PV Modules. The measurements shall be made at all the major corners of the array with no adjacent measurement being more than 40 feet apart. The points of measurement shall be distributed evenly between two major corners if they are more than 40 feet apart such that the linear distance between any sequential points is no more than 40 feet.

Modules:
Under the CSI Program, a module is the smallest complete environmentally protected assembly of interconnected photovoltaic cells. Modules are typically rated between 50 and 300 W.

Nationally Recognized Testing Laboratory (NRTL):
The Occupational Safety and Health Administration's (OSHA) Directorate of Science, Technology, and Medicine operates a program that certifies private sector organizations as NRTLs, which subsequently judges that specific equipment and materials ("products") meet consensus-based standards of safety for use in the U.S. workplace. Under the CSI Program, PV Modules must be certified to UL 1703 by a Nationally Recognized Testing Laboratory (NRTL). Inverters must be certified to UL 1741 by a NRTL.

Net Energy Metering (NEM) Agreement:
An agreement with the local utility which allows customers to reduce their electric bill by exchanging surplus electricity generated by certain renewable energy systems such as the PV systems the CSI subsidizes. Under net metering, the electric meter runs backwards as the customer-generator feeds extra electricity back to the utility. The CSI Program permits net energy metering agreements.

New Solar Homes Partnership (NSHP):
A California Energy Commission program offered as of January 1, 2007 that works with home builders and the building industry to accelerate the growth of PV in residential new construction.

Non Profit:
A Non-Profit institution is an entity not conducted or maintained for the purpose of making a profit, and is registered as a 501(c)3 corporation. No part of the net earnings of such entity accrues or may lawfully accrue to the benefit of any private shareholder or individual.

North American Board of Certified Energy Practitioners (NABCEP):
A professional association developing a voluntary national certification program for solar practitioners. Although not required by the CSI Program, installation contractors are encouraged to become certified by the NABCEP.

Pacific Gas and Electric Company (PG&E):
An investor-owned utility (IOU). The utility that provides natural gas and electricity to most of Northern California.

Parallel Operation:
The simultaneous operation of a self-generator with power delivered or received by the electrical utility while interconnected to the grid. Parallel Operation includes only those PV systems that are interconnected with the Electric Utility distribution system for more than 60 cycles.

Payee:
The person, or company, to whom the CSI Incentive check is made payable.

Photovoltaic (PV):
A technology that uses a semiconductor to convert light directly into electricity.

Power Purchase Agreements:
An agreement for the sale of electricity from one party to another, where the electricity is generated and consumed on the Host Customer Site. Agreements that entail the export and sale of electricity from the Host Customer Site do not constitute on-site use of the generated electricity and therefore are ineligible for the CSI.

Program Administrator (PA):
For purposes of the CSI Program, PG&E, SCE & CSE (which administers the program on behalf of SDG&E).

Program Year (PY):
January 1 through December 31.

Proof of Project Milestone Date:
The Proof of Project Milestone Date is the date when required information to demonstrate that a Project seeking CSI Incentives is moving forward is due.

Project:
For purposes of the CSI, the “Project” is the installation and operation of the proposed eligible PV system, as described by the submitted Reservation Request documentation.

Public Entity:
Includes the United States, the state and any county, city, public corporation, or public district of the state, and any department, entity, agency, or authority of any thereof.[29]

Rebuild A Greener San Diego Photovoltaic Incentive Program:
San Diego area program authorized by the CPUC Resolution E-3860, created to provide incentives to homeowners rebuilding homes affected by the October 2003 wildfires. The Rebuild a Greener San Diego Photovoltaic Incentive Program accepted applications from April 1, 2004 through May 31, 2006.

Renewable:
Electricity supplied by energy sources that are naturally and continually replenished, such as wind, solar power, geothermal, small hydropower, and various forms of biomass.

Reservation Expiration Date:
The Reservation Expiration Date is the date up to when the project is active in the CSI Program.

Residential:
Residential entities are private household establishments that consume energy primarily for space heating, water heating, air conditioning, lighting, refrigeration, cooking, and clothes drying. The classification of an individual consumer's account, where the use is both residential and commercial, is based on principal use. A power purchase agreement on a residence is considered a residential application. It should be noted that the CSI Incentive rate will be determined by the utility rate schedule of the Host Customer (may require more than one application). If the requested incentive rate differs from the classification of the Host Customer utility rate schedule, the PAs may, at their discretion, allow the requested incentive rate given that the Host Customer change its utility rate schedule.

Retro-commissioning:
A process to identify how major energy using equipment is being operated and maintained and to identify specific improvements to the performance of those energy using systems. The process uses a whole building systems approach to identify problems and needed repairs or adjustments to achieve energy savings, occupant comfort and improved systems performance. A commissioning agent identifies and makes the necessary equipment adjustments and identifies energy efficiency projects that will improve overall building performance.

Retrofit:
A retrofit is a modification of an existing building or facility to include new systems or components.

San Diego Gas & Electric Company (SDG&E):
One of California's four investor-owned utilities (IOU's). SDG&E provides natural gas and electricity to San Diego County and southern Orange County in southern California. It is owned by Sempra Energy. The CSI Program is available to customers of PG&E, SCE and SDG&E.

29 Source: CALIFORNIA CODES - PUBLIC CONTRACT CODE, SECTION 21611

Self-Generation Incentive Program (SGIP):
The SGIP, created pursuant to California Assembly Bill 970, provided financial incentives for business and residential customers who install up to 5.0 MW of "clean" distributed generation equipment onsite. The current program runs through December 31, 2011. The SGIP was extended in modified form for certain technologies through AB 1685.

Seller:
Any person or business entity that transfers property or property rights by sale in commerce.

Senate Bill 1 (SB 1):
Chapter 132, Statutes of 2006 (SB1, Murray) establishes the goals of installing 3,000 MW of solar generation capacity in the state of California, establishing a self-sufficient solar industry, and placing photovoltaic systems on 50 percent of new California homes within 13 years. The bill was signed into law on August 21, 2006, and it became effective on January 1, 2007. SB 1 requires the CPUC, in implementing the California Solar Initiative (CSI) to adopt performance-based subsidies (i.e., subsidies that pay based on the amount of electricity produced) by January 1, 2008 where 100% of incentives are based on performance for all PV systems 100 kW and larger, and 50% of incentives are based on performance for systems 30 kW and larger. Performance-based subsidies are encouraged, but not required, for smaller systems. Moreover, SB 1 authorizes the CPUC to award $101 million in subsidies for electric-displacing solar thermal systems and authorizes the CPUC to award $50 million for solar research and development. The bill requires municipal utilities to establish solar energy programs in support of the 3,000 MW goal and raises the net metering cap from 0.5 percent to 2.5 percent.

Site:
The Host Customer's premises, consisting of all the real property and apparatus employed in a single enterprise on an integral parcel of land undivided, excepting in the case of industrial, agricultural, oil field, resort enterprises, and public or quasi-public institutions divided by a dedicated street, highway or other public thoroughfare or railway. Automobile parking lots constituting a part of and adjacent to a single enterprise may be separated by an alley from the remainder of the premises served. Separate business enterprises or homes on single parcel of land undivided by a highway, public road, and thoroughfare or railroad would be considered for purposes of CSI as separate Sites. Each individual Site must be able to substantiate sufficient electrical load to support the proposed system size. An additional exception to this definition includes eligible customers taking service under the NEM Aggregation pursuant to Utility NEM tariff. See subsection 'a'.

a.) NEMA Site:

For eligible customers participating in NEM Aggregation pursuant to a Utility NEM tariff, the definition of Contiguous Site herein applies. For purposes of calculating onsite load, the sum of all metered load from all accounts participating in a NEM Aggregation agreement (i.e., the Generating Account and All Aggregated Account(s)) pursuant to a Utility NEM tariff is used.

Solar Irradiance:
Radiant energy emitted by the sun, particularly electromagnetic energy. In the CSI Program the CEC-AC rating standards are based upon 1,000 Watt/m^2 solar irradiance, 20 degree Celsius ambient temperature, and 1 meter/second wind speed. The CEC-AC watt rating is lower than the Standard Test Conditions (STC), a watt rating used by manufacturers.

Southern California Edison Company (SCE):
An investor owned utility (IOU) that provides electricity in a 50,000-square mile service territory in Southern California.

Standard Test Conditions (STC):
A watt rating used by manufacturers of photovoltaic cells or modules. The CEC-AC watt rating used in the CSI is lower than the Standard Test Conditions.

Surface Orientation Factor (SOF):
The ratio of the annual incident solar radiation on a surface for a specific tilt and orientation (MJ/m2/year) divided by the annual incident solar radiation on a surface for a south-facing surface with optimal tilt (MJ/m2/year).

Solar Energy System Contractor:
The Solar Energy System Contractor is responsible for installing for the Host Customer the photovoltaic system that will be eligible to receive CSI Incentives. A qualified Solar Contractor should be able to evaluate factors that will affect photovoltaic system performance, such as the orientation (tilt and direction) of the system, wire length and size, shading, module output mismatch, inverter efficiency, module cleanliness, and other factors.

System Owner:
The owner of the PV system at the time the incentive is paid. For example, in the case when a vendor sells a turnkey system to a Host Customer, the Host Customer is the System Owner. In the case of a leased system, the lessor is the System Owner.

System Size:
Generally, under the CSI, system size is defined as the capacity of a given photovoltaic system based upon CEC-AC rating standards. Under the CSI Program, the incentive is determined based on the expected production of electricity by the system, which may not exceed the actual energy consumed during the previous 12 months at the Site (see Section 2.2.4).

Time of Use (TOU) Rates:
Electricity prices that vary depending on the time periods in which the energy is consumed. In a time-of-use rate structure, higher prices are charged during utility peak-load times. Such rates can provide an incentive for consumers to curb power use during peak time.

UL Listed:
Tested and listed by the Underwriters Laboratories, Inc. In the CSI Program, PV modules must be certified to UL 1703 by a Nationally Recognized Testing Laboratory (NRTL). Inverters must be certified to UL 1741 by a NRTL.

Vendor:
A seller of property, goods, or services. According to the CSI Program, in cases when a vendor sells a PV system to a Host Customer, the Host Customer is the System Owner.

Warranty:
A promise, either written or implied, that the material and workmanship of a product are without defect or will meet a specified level of performance over a specified period of time. In the CSI Program, inverters and modules must each carry a 10 year warranty, and meters a one-year warranty. Meters that are integrated in the inverter must carry a 10-year warranty. The warranty may be provided in combination by the manufacturer and Solar Contractor.

Appendix B: Additional Requirements and Terms

In addition to the Program eligibility criteria and requirements described above in the Handbook, the following additional items are required of MASH Program participants.

B.1 MASH Program Handbook Requirements

By execution of the MASH Program Contract, the System Owner and Host Customer each certifies that 1) they have received and read a copy of the current MASH Program Handbook; 2) the Project meets all Program eligibility requirements; and 3) that the System Owner and Host Customer agree to abide by the rules and requirements set forth in the MASH Program Handbook.

B.2 Authority to Install System

The Host Customer and System Owner represent that they have the authority to install the generating system at the Project Site, or have obtained the permission of the legal owner of the Project Site, to install the generating system. System Owner and Host Customer shall, at their own expense, obtain and maintain all licenses and permits needed to perform work on the Project.

B.3 No Endorsement by Program Administrator

The Host Customer and System Owner understand that the Program Administrator's review of the Project and authorization for MASH funding shall not be construed as confirming or endorsing the qualifications of the Applicant or any person(s) involved with the Project, including but not limited to the Project Solar Contractor(s), designer(s), or manufacturer(s); endorsing the Project design; or as warranting the economic value, safety, durability or reliability of the Project. The Host Customer is solely responsible for the Project, including selection of any designer(s), manufacturer(s), contractor(s), or Solar Contractor(s). The Host Customer and System Owner understand that they, and any third parties involved with the Project, are independent contractors and are not authorized to make any representations on behalf of the Program Administrator. The Host Customer and System Owner shall not use the Program Administrator's corporate name, trademark, trade name, logo, identity, or affiliation for any reason, without prior written consent of the Program Administrator.

B.4 Dispute Resolution

The parties to the MASH Contract shall attempt in good faith to resolve any dispute arising out of or relating to it promptly by negotiations between a vice president of the Program Administrator or his or her designated representative and an executive of similar authority from the System Owner and/or Host Customer. Either party must give the other party or parties written notice of any dispute. Within 30 calendar days after delivery of the notice, the executives shall meet at a mutually acceptable time and place, and shall attempt to resolve the dispute. If the matter has not been resolved within 30 calendar days of the first meeting, any party may pursue other remedies, including mediation. All negotiations and any mediation conducted pursuant to this clause are confidential and shall be treated as compromise and settlement

negotiations, to which Section 1152.5 of the California Evidence Code shall apply, and Section 1152.5 is incorporated herein by reference. Notwithstanding the foregoing provisions, a party may seek a preliminary injunction or other provisional judicial remedy if in its judgment such action is necessary to avoid irreparable damage or to preserve the status quo. Each party is required to continue to perform its obligations under this Contract pending final resolution of any dispute arising out of or relating to this Contract.

B.5 Assignment

The System Owner and Host Customer consent to Program Administrator's right to assign of all of Program Administrator's rights, duties and obligations under this Contract to the CPUC and/or its designee. Any such assignment shall relieve the Program Administrator of all rights, duties and obligations arising under the CSI Contract. Neither System Owner nor Host Customer shall assign its rights or delegate its duties without the prior written consent of the Program Administrator or its assignee, if any, except in connection with the sale or merger of a substantial portion of its assets. Any such assignment or delegation without the prior written consent of Program Administrator or its assignee, if any, shall be null and void. Consent to assignment shall not be unreasonably withheld or delayed. The System Owner and Host Customer must provide assurance of the success of a Project if assigned by providing any additional information requested by the Program Administrator.

B.6 No Third Party Beneficiaries

The MASH Contract is not intended to confer any rights or remedies upon any persons other than the parties to it, as indicated by signature of the Contract.

B.7 Indemnification

To the greatest extent permitted by applicable law, the Host Customer and System Owner agree to indemnify, defend, and hold harmless the Program Administrator, its affiliates, subsidiaries, current and future parent companies, officers, managers, directors, agents, and employees from all claims, demands, losses, damages, costs, expenses, and liability (legal, contractual, or otherwise), which arise from or are in any way connected with any: 1) injury to or death of persons, including but not limited to employees of the Program Administrator, Host Customer, System Owner, or any third party, 2) injury to property or other interests of the Program Administrator, Host Customer, System Owner, or any third party, 3) violation of local, state, or federal common law, statute, or regulation, including but not limited to environmental issue or regulations, 4) strict liability imposed by any law or regulation, or 5) generation system performance shortfall; so long as such injury, violation, strict liability, or shortfall (as set forth in 1-5 above) arises from or is in any way connected with the Project, including the Host Customer's, System Owner's, or third party's performance or failure to perform with respect to the Project, however caused, regardless of any strict liability or negligence of the Program Administrator, its officers, managers, or employees, excepting only such loss, damage, or liability that is caused by the willful misconduct of the Program Administrator, its officers, managers, or employees.

B.8 Limitation of Liability

The Program Administrator shall not be liable to the System Owner, Host Customer or to any of their respective contractors or subcontractors for any special, incidental, indirect or consequential damages whatsoever, including, without limitation, loss of profits or commitments, whether in contact, warranty, indemnity, tort (including negligence), strict liability or otherwise arising for the Program Administrator's performance or nonperformance of its obligations under the CSI Contract.

B.9 Term and Termination

The Tem of the CSI Contract shall begin on the date that the last Party signs it, and shall continue for 10 years, unless terminated earlier pursuant to the operation of the Contract, or unless modified by order of the CPUC by written agreement of the Parties to the Contract.

The Contract may be terminated by the Program Administrator in the event a) the System Owner or Host Customer fails to perform a material obligation under the Contract and the System Owner or Host Customer fails to cure such default within 10 days of receipt of written notice from the Program Administrator, or b) any statement, representation or warranty made by the System Owner or Host Customer in connection with the Program or the Contract is false, misleading or inaccurate on the date as of which it is made.

The termination of the Contract shall not operate to discharge any liability which has been incurred by either Party prior to the effective date of such termination.

B.10 Venue

The MASH Contract shall be interpreted and enforced according to the laws of the State of California. Sole jurisdiction and venue shall be with the courts in San Francisco, Los Angeles or San Diego Counties, as per the Program Administrator's service territory.

B.11 Integration and Modification

The MASH Contract and MASH Handbook constitute the entire Contract and understanding between the Parties, as to the Contract's subject matter. It supersedes all prior or contemporaneous contracts, commitments, representations, writings, and discussions between the System Owner, Host Customer, and Program Administrator concerning the Project, whether oral or written, and shall not be induced by any representations, statements or contracts other than those expressed therein.

No amendment, modification or change of the Contract shall be binding or effective unless expressly set forth in writing and signed by the Program Administrator's representative authorized to do so.

B.12 PMRS Transfer of Solar Production Data

By signing the MASH Contract, the Host Customer and/or System Owner are responsible for ensuring the transfer of solar production data from the Performance Monitoring and Reporting Service (PMRS) Providers to the Program Administrators.

Appendix C: Inverter Integral 5% Meter Performance Specification and Test Requirements

Version: Initial Release
Release Date: 3/25/09

Pete Baumstark, KEMA, Inc., in collaboration with the CSI Metering Subcommittee

C-1 Overview 97
C-1.1 Objectives 97
C-1.1.1 Approach and Methodology 97
C-1.1.2 Scope and Purpose 98
C-2 Definitions and References 99
C-2.1 Definitions 99
C-2.2 References 102
C-3 Test and Equipment Requirements 103
C-3.1 General Requirements 103
C-3.2 Test Measurement Requirements 104
C-3.3 Inverter AC Power Supply Requirements 104
C-3.4 Reference Meter Requirements 104
C-3.5 Test Set-up Requirements 105
C-3.6 Recording Energy Readings 105
C-3.7 Accuracy Performance Check Procedure 105
C.3.7.1 Reporting of Data 106
C.3.7.2 Pass/Fail Criteria 106
C-3.8 Tests Performed In Series 106
C-3.9 Weather Survivability 107
C-4 Specific Test Requirements 108
C-4.1 Test No. 1: No Load 108
C-4.1.1 Test No. 1a: No Load 108
C-4.1.2 Test No. 1b: No Load 109
C-4.2 Test No. 2: Load Performance 109
C-4.2.1. Reporting of Data 109
C-4.2.2 Pass/Fail Criteria 110
C-4.3 Test No. 3: Effect of Variation of Voltage 110
C-4.3.1 Purpose 110
C-4.3.2 Reporting of Data 112
C-4.3.3 Pass/Fail Criteria 112
C-4.4 Test No. 4: Effect of Variation of Frequency 113
C-4.4.1 Purpose 113
C-4.4.2 Reporting of Data 114
C-4.4.3 Pass/Fail Criteria 114
C-4.5 Test No. 5: Effect of Internal Heating 114
C-4.5.1 Reporting of Data 116
C-4.5.2 Pass/Fail Criteria 116
C-4.6 Test No. 6: Stability of Performance 116

C-4.6.1 Reporting of Data 117
C-4.6.2 Pass/Fail Criteria 117
C-4.7 Test No. 7: Independence of Elements 118
C-4.7.1 Reporting of Data 118
C-4.7.2 Pass/Fail Criteria 118
C-4.8 Test No. 8: Insulation 118
C-4.9 Test No. 9: Voltage Interruptions 119
C-4.9.1 Test No. 9a: Voltage Interruptions from Short Circuits 119
C-4.9.2 Test No. 9b: Voltage Interruptions from Loss of Control Circuit 119
C-4.10 Test No. 10: Effect of High Voltage Line Surges 119
C-4.11 Test No. 11: Effect of Variation of Ambient Temperature 119
C-4.11.1 Reporting of Data 122
C-4.11.2 Pass/Fail Criteria 124
C-4.12 Test No. 12: Electrical Fast/Transient Burst 124
C-4.13Test No.13: Effect of Electrical Oscillatory Surge Withstand Capabilities (SWC) test124
C-4.14 Test No. 14: Effect of Radio Frequency Interference 124
C-4.15 Test No. 15: Radio Frequency Conducted and Radiated Emission 125
C-4.16 Test No. 16: Effect of Electrostatic Discharge (ESD) 125
C-4.17 Test No. 17: Effect of Operating Temperature 125
C-4.18 Test No. 18: Effect of Relative Humidity 125

Appendices

Inverter Meter Test Summary (Table D-A-1) ..... Appendix C-A
Equations Summary (Table D-B-1) ..... Appendix C-B

C-1 Overview

Metering devices have been an integral part of DC to AC inverters for many years. Previously, there have been no performance requirements that have been applied to verify accuracy of these metering devices. This purpose of this document[30] is to create those requirements. It draws upon several existing standards and methods to establish inverter metering accuracy requirements.

C-1.1 Objectives

The objective of this document is to provide a test protocol and performance specification that would be used for verifying inverter integral metering devices to ± 5% accuracy. The test procedures and specifications herein were developed under the assumption that the primary user of this information is either an inverter manufacturer or a Nationally Recognized Test Lab (NRTL) that is recognized by the Occupational Safety and Health Administration (OSHA) as capable of certifying products to UL1741. Many of the tests that are specified in this document can be performed concurrently with UL1741 certification.

Tests specified in this document are either classified as Series or Non-Series. Series tests are to be performed on the same unit whereas Non-Series tests can be performed on other units of the same unique model number. A unique model can pass certification to these requirements by having tests performed on various sample units, and therefore is not required to have all these tests performed on the same unit. Type testing requires each test to be performed on a unique model number. Production testing requires one test to be performed on a sampling of production units. See Appendix C-A for a listing of test classifications along with a brief over view of the tests.

C-1.1.1 Approach and Methodology

The following steps (many of which were established by the PV Metering Subcommittee) were used to develop the test requirements presented in this document:

1) Survey of applicable standards relative to meter and inverter certification protocols. These include UL1741, IEEE 1547.1, ANSI C12.1 & the Sandia Inverter Test Protocols.

2) Tabulate ANSI C12.1 tests and determine both applicability for inverter meters and synergies with requirements and intent of UL1741 and IEEE 1547.1 tests. Some test environments defined in ANSI C12.1 are more severe than UL1741 or IEEE 1547.1 environments. In such cases, the UL1741 or IEEE 1547.1 environments were used. Inverter metering systems are only expected to perform under the same environments under which inverters are expected to perform.

3) Obtain industry/technical/certification expert feedback.

[30] "Document" used in this context here and elsewhere in this Appendix refers to this Appendix D of the CSI Handbook.

4) Perform trial runs of the identified tests at an NRTL's facility and include feedback on feasibility.

5) Write draft requirements for review.

C-1.1.2 Scope and Purpose

This document provides test requirements for certification of inverter integral metering systems to an accuracy of ± 5%, as measured at the AC output terminals of the inverter or the supplied/required transformer. These requirements are intended to be used in conjunction with certification of inverter products designed for grid-connected PV systems. There is also one test that is designed to be easily performed in conjunction with the California Energy Commission's SB1 eligibility guidelines required weighted efficiency testing (known as Sandia Inverter Test Protocols).

Tests include accuracy verification under a number of typical operational scenarios and abnormal situations that are deemed reasonable based on established certification protocols.

Test protocols are applicable to integrated metering systems, but do not include displays, data logging, data retention or communication devices.

Inverters that have already been certified to UL1741 may have their metering systems certified to ± 5% accuracy per these requirements by submitting samples for testing under these requirements. The long-term purpose of these requirements is to have inverter metering systems certified to ± 5% accuracy in conjunction with UL1741 certification. Every effort has been made to allow appropriate synergies between meter accuracy certification and UL1741 certification.

These tests are intended to supplement UL1741 and are not intended to duplicate or conflict with the UL1741 safety, power quality, utility interconnection, or thermal requirements. Should there be any conflict between UL1741 or IEEE 1547.1 and these requirements, UL1741 and IEEE 1547.1 shall take precedence.

C-2 Definitions and References

C-2.1 Definitions

Accuracy: The extent to which a given measurement agrees with the defined value. (from ANSI C12.1-2008)

Calibration: Comparison of the indication of the instrument under test, or registration of the meter under test, with an appropriate standard. (from ANSI C12.1-2008)

Data Acquisition System (DAS): A system that receives data from one or more locations. (from IEEE Std. 100-1996)

Disconnect Switch: A switching device that breaks an electrical circuit. These devices may have AC or DC voltage and current ratings and may or may not be rated for breaking under load. Disconnect switches usually provide a visible break, and may have a locking feature to provide control over the status of the disconnect switch.

Display: A means of visually identifying and presenting measured or calculated quantities and other information. (from ANSI C12.1-2008)

Efficiency: The ratio of the usable AC output power to the total DC + AC input power.

Electric Power System (EPS): (from IEEE Std 1547-2003), Facilities that deliver electric power to a load.

Insolation: A measure of solar radiation energy received on a given surface area in a given time. It is commonly expressed as average irradiance in watts per square meter (W/m^2) or kilowatt-hours per square meter per day ($kW \cdot h/(m^2 \cdot day)$) (or hours/day).

Interconnection: The equipment and procedures necessary to connect an inverter or power generator to the utility grid. IEEE Std. 100-1996 Def: *The physical plant and equipment required to facilitate transfer of electric energy between two or more entities. It can consist of a substation and an associated transmission line and communications facilities or only a simple electric power feeder.*

Inverter: A machine, device, or system that changes direct-current power to alternating-current power. For the purposes of this test procedure, the inverter includes any input conversion (i.e., DC-DC chopper) that is included in the inverter package and any output device (i.e. transformer) that is required for normal operation.

Islanding: Continued operation of a photovoltaic generation facility with local loads after the removal or disconnection of the utility service. This is an unwanted condition that may occur in the rare instance of matched aggregate load and generation within the island.

Inverter Integral Meter: Electricity metering device or system of devices, which measures and registers AC electricity values, and has provisions for a user interface. The entire meter must be physically located within the environmental enclosure of an inverter. For the purpose of this specification, the meter must, at a minimum, be capable of registering cumulative AC energy (watthours). The meter is not required to have a local display.

I-V Curve: A plot of the photovoltaic array current versus voltage characteristic curve. The shape of I-V curve is dependent on the PV cell technology, the configuration of the cells and other devices (e.g., bypass diodes) within the array, varying incident solar irradiance intensity and spectral content, and PV cell temperature.

Listed Equipment: Equipment, components or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or materials meets appropriate standards or has been tested and found suitable for use in a specified manner. (from the National Electrical Code; Article 100.)

Multi-Phase Units: An inverter which exports power on more than 2 conductors.

Non-islanding: Intended to prevent the continued existence of an island. (from IEEE 1547-2003)

Nationally Recognized Testing Laboratory (NRTL): A listing organization that has passed the Recognition Process by the United States Occupational Safety & Health Administration (OSHA) to certify products to specific standards. A full product certification includes testing of the product to applicable standards and follow-up services, or visits to the manufacturing facility, to ensure consistency of materials and processes that could affect product safety.

Power – Active: The time average of the instantaneous power over one period of the wave. Note: For sinusoidal quantities in a two-wire circuit, it is the product of the voltage, the current , and the cosine of the phase angle between them. For nonsinusoidal quantities, it is the sum of all the harmonic components, each determined as above. In a polyphase circuit, it is the sum of the active power of the individual phases. (from ANSI C12.1-2008)

Power – Apparent: The product of rms current and rms voltage for any wave form in a two-wire circuit. For sinusoidal quantities, apparent power is equal to the square root of the sum of the squares of the active and reactive power in both two-wire and polyphase circuits.

Power – Reactive: For sinusoidal quantities in a two-wire circuit, reactive power is the product of the voltage, the current, and the sine of the phase angle between them, using the current as reference. (from ANSI C12.1-2008)

Reference Meter: An electricity meter used, on the AC side only, as a basis for comparison with inverter integral meter performance under test conditions. For AC energy measurements, reference meters shall be capable of registering energy flow in the positive direction (from the inverter) only.

Simulated Utility: An assembly of voltage and frequency test equipment replicating a utility power source. Where appropriate, the actual Area EPS can be used as the Simulated Utility. (From IEEE P1547.1)

Unit Under Test (UUT): The particular inverter undergoing the specified test.

Utility: For this document, the organization having jurisdiction over the interconnection of the photovoltaic system and with whom the owner may enter into an interconnection agreement. This may be a traditional electric utility, a distribution company, or some other organization. IEEE 100 Def: *An organization responsible for the installation, operation, or maintenance of electric supply or communications systems.*

C-2.2 References

Principal references used in this document are as follows:

1) UL1741, “Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources”, November 7, 2005

2) ANSI C12.1-2008, “American National Standard for Electric Meters – Code for Electricity Metering”, June 27, 2008

3) IEEE Std 1547.1™-2005, “IEEE Standard Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems”, July 1, 2005

4) “Performance Test Protocol for Evaluating Inverters Used in Grid-Connected Photovoltaic Systems”, Ward Bower, Chuck Whitaker, William Erdman, Michael Behnke, Mark Fitzgerald; October 2004 (This document is sometimes referred to as the Sandia document)

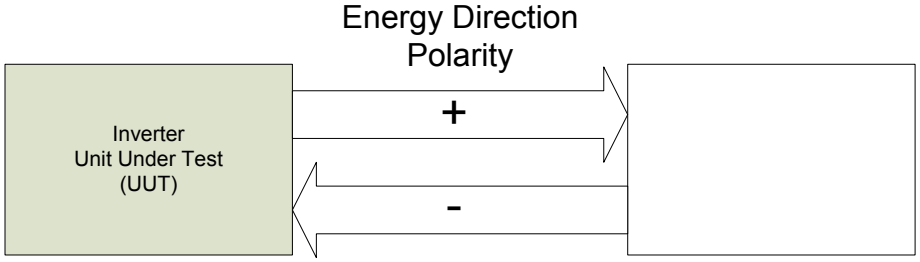
5) IEEE C37.90.1-1989, “IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems”, June 1989

C-3 Test and Equipment Requirements

C-3.1 General Requirements

As a standard convention, the power provided by the inverter to the AC power source is considered positive and power supplied by the AC power source to the inverter is considered negative.

Figure C-3-1: Energy Direction Polarity



For tests that require a recording of a stabilized operating temperature, temperatures are considered to be stable when three successive readings taken at not less than 15 minute intervals or not more than 10% of the previous elapsed duration following an initial 150 minutes of operation indicates no more than 1°C (1.8 °F) variation between any two readings..

C-3.2 Test Measurement Requirements

Unless otherwise specified, the requirements in this section apply to all test procedures. Basic measurement equipment uncertainty requirements are provided in Table C-3-1.

Table C-3-1: Basic Measurement Uncertainty Requirements

Parameter True RMS (V,I,P)	Allowable Maximum Uncertainty	Preferred Maximum Uncertainty
AC Voltage	± 1% of reading	± 0.25% of reading
AC Current	± 1% of reading	± 0.5% of reading
AC Power*	± 1% of reading	± 0.5% of reading
AC Energy*	± 1% of reading	± 0.5% of reading
AC Frequency	± 0.05 Hz	± 0.01 Hz
Temperature	±1°C	±0.5°C

*Note: AC power and energy measurements should include only the usable 60Hz power.

Though some of the wording of this document may imply a data acquisition system and logging, any suitable equipment or method that provides the necessary functionality and accuracy may be used to perform these tests.

Input voltages and currents are to be measured at the input terminals of the UUT or between the input supply (e.g., PV array) and the connection point of any optional or ancillary equipment external to the UUT. Output voltages and currents are measured at the output terminals of the UUT or at output terminals of the supplied/required external transformer.

Ambient air temperature shall be measured at least 6 inches (15 cm) horizontally away from the UUT enclosure and at the mid-point of the height of the enclosure, and out of the UUT's convection or forced airflow. Ambient air movement will be minimized only to the extent it is necessary to maintain ambient temperature at the specified level. When an environmental chamber is used to control temperature, shrouds or secondary enclosures may be needed to meet this requirement.

Inverter temperature shall be measured internally, at the switching device, or as close as practical.

All test equipment shall be calibrated and traceable to appropriate NIST or other standards.

C-3.3 Inverter AC Power Supply Requirements

The AC power supply (connected to the AC output of the UUT) may be either a simulated utility or the actual utility. A simulated utility must conform to the requirements defined in IEEE 1547.1, paragraph 4.6.1, Simulated area EPS (utility) source requirements.

C-3.4 Reference Meter Requirements

Some tests require the use of a reference energy meter to verify the accuracy of the integral metering device of the UUT. Reference energy meters shall be certified to a minimum accuracy

of, ± 0.5% of watt-hour production. Reference meter calibration shall be verified prior to any series of tests performed on each UUT.

C-3.5 Test Set-up Requirements

Each test set-up shall include the configuration the UUT will see in the field (e.g. all faceplates and covers installed, normal position, and all ground terminals wired to ground).

If the UUT has the option of an integral meter display, such a display shall be installed in normal position. It is not necessary to include connections for any remote display device.

C-3.6 Recording Energy Readings

This specification is intended to verify energy (watt-hour) production accuracy of inverter integral metering devices. For each test that specifies the recording of energy production, the UUT must run for a suitable time period to record watt-hour production. The time period may vary for different UUT model numbers based on the design of its integral metering device.

C-3.7 Accuracy Performance Check Procedure

Some tests require a periodic Accuracy Performance Check, which would be performed before and after the test. The UUT meter power output shall be read and compared to the energy output reading from a calibrated reference meter. The purpose of the check is to determine whether any detrimental damage occurred to the UUT metering device during specific tests. Where an “Accuracy Performance Check” is specified, the following procedure shall be followed:

a) Install reference meter between UUT output and power source.

b) Connect the UUT according to the instructions and specifications provided by the manufacturer to the selected input and output power sources.

c) Set all input source parameters to the nominal operating conditions for the UUT.

d) Set (or verify) all UUT parameters to the nominal operating settings.

e) Set the UUT (including the input source as necessary) to provide 20% ± 3% of its rated output power.

f) Record all applicable settings.

g) After allowing the inverter output power to stabilize, record energy (watt-hours) from both the inverter meter and the reference meter.

h) Set the UUT (including the input source as necessary) to 100% ± 3% of its rated output power.

i) After allowing the inverter output power to stabilize, record energy (watt-hours) from both the inverter meter and the reference.

j) Power down the input and output sources per manufacturers instructions.

k) Disconnect input and output power sources from the UUT.

l) Perform the specified environmental test.

m) Repeat steps a) through k).

C-3.7.1 Reporting of Data

For the test, report and calculate pre- and post- environmental test:

- Inverter meter output energy at 20% and 100%
- Reference meter energy at 20% and 100%
- The percent registration for all four cases.

The percent registration is calculated per Equation D-3-1.

Equation D-3-1: Percent Registration
Percent Registration = 100 x (Ref Meter Energy – Inverter Meter Energy)/Ref Meter Energy

C-3.7.2 Pass/Fail Criteria

The unit passes if the following two cases are met:

- At 20% output, the absolute difference between Percent Registration pre- and post-environmental test is less than 2.5%.
- At 100% output, the absolute difference between Percent Registration pre- and post-environmental test is less than 2.5%.

C-3.8 Tests Performed In Series

The following tests shall be conducted using the same inverter: Insulation, Voltage Interruptions from Loss of Control Circuit, Effect of High Voltage Line Surges, Electrical Fast/Transient Burst, Effect of Electrical Oscillatory Surge Withstand Capabilities (SWC) Test, Effect of Electrostatic Discharge (ESD) and Effect of Relative Humidity.

An Accuracy Performance Check per D-3.7 is specified to be performed in conjunction with each of these tests per this document. It is permissible to perform the Accuracy Performance Check, at a minimum, pre- and post- the entire block of series tests.

C-3.9 Weather Survivability

ANSI C12.1 defines several weather survivability tests for metering devices. UL1741 and IEEE 1547.1 also define several weather survivability tests for inverters. These requirements were developed with the assumption that inverter integral metering devices are to survive all environments that inverters are designed and tested to survive. Therefore weather survivability tests in conformance with, or similar to, the ANSI C12.1 tests are not included in these requirements.

C-4 Specific Test Requirements

C-4.1 Test No. 1: No Load

This test is intended to ensure the inverter metering device is not registering energy output with the inverter on, power sources and metering circuitry active, but no AC power being generated. The test is performed as a Type test in the lab, and also as a Production test which may be performed in the manufacturers' facility. The sampling criteria for production no-load output tests are to be determined by the NRTL in collaboration with the inverter manufacturer. Based on their experience, credibility, and requisite need to maintain their rating as a NRTL (the NRTL is deemed to be an appropriate authority for setting sample criteria based on inverter models submitted for testing.) The Specifications do not require every production unit to be tested.

C-4.1.1 Test No. 1a: No Load

The purpose of this test is to ensure the inverter meter is not registering generation when no load is on the UUT.

a) Adjust the test environment air temperature to 23°C ± 5°C.

b) Connect the UUT according to the instructions and specifications provided by the manufacturer to the selected output power source.

c) Set (or verify) all UUT parameters to the nominal operating settings. Temporary adjustment of UUT grid re-connections timer(s) is allowable for the duration of this test.

d) Set output power source to the UUT's rated voltage +/- 2%.

e) Set input power source to the UUT's nominal operating input voltage +/- 2%.

f) Ensure the UUT is on, with the metering circuitry active, but not producing any AC energy.

g) Record all applicable settings.

h) Measure and record inverter and reference meter energy (kWh) output for a duration of 15 minutes.

C-4.1.1.1 Reporting of Data

For the test, calculate and report:

- Inverter and reference meter energy output. The reference meter is used to ensure no actual AC output energy has been produced.

C-4.1.1.2 Pass/Fail Criteria

The unit passes if the inverter meter reads 0-1% of inverter's rated energy power output for the 15 minute duration.

C-4.1.2 Test No. 1b: No Load

The manufacturer is to perform the same test procedure as Test No 1a on a sampling of their production units. The sampling rate is determined by the NRTL, in collaboration with the manufacturer. These tests may be performed at the manufacturing facility.

C-4.2 Test No. 2: Load Performance

The purpose of this test is to verify the accuracy of the metering device throughout the operating power range of the UUT. The test is designed to be easily run concurrently with Sandia Test "Conversion Efficiency", paragraph 5.5.

Perform per the Sandia Conversion Efficiency test procedure with the following additions/modifications:

1) Install test reference meter between the inverter AC output and the power source.

2) In step 6, record energy (kWh) produced from the inverter meter and the reference meter at the end of each power level. For this test, it's only necessary to record energy production at the end of 10, 20, 30, 50, 75 and 100% power levels.

C-4.2.1 Reporting of Data

For each power level at each test condition, calculate and report:

- Inverter meter output energy (kWh) at each of the six power levels

- Reference meter energy (kWh) at each of the six power levels

- Meter accuracy levels at each of the six power levels

Determine meter accuracy levels per Equation C-4-2:

Equation C-4-2 Percent Accuracy

% Accuracy = 100 x (Inverter Meter kWh – Reference Meter kWh) / Reference Meter kWh

Enter the meter accuracy levels in the format shown in Table C-4-1.

Table C-4-1: Meter Accuracy Levels

Test	V_{dc}	V_{ac}	Inverter DC Input Power Level					
			10%	20%	30%	50%	75%	100%
A	V_{nom}	V_{nom}						
B	V_{max}	V_{nom}						
C	V_{min}	V_{nom}						

Calculate the weighted accuracy of the meter per Equation C-4-3 for each test (A, B & C).

Equation C-4-3 Weighted Accuracy

$$\eta_{Wtd} = 100 \times (0.04 \times \eta_{10} + 0.05 \times \eta_{20} + 0.12 \times \eta_{30} + 0.21 \times \eta_{50} + 0.53 \times \eta_{75} + 0.05 \times \eta_{100})$$

C-4.2.2 Pass/Fail Criteria

The UUT passes the test if the weighted accuracy is less than ± 5% for each test (A, B & C).

C-4.3 Test No. 3: Effect of Variation of Voltage

C-4.3.1 Purpose

The purpose of this test is to verify the accuracy stability of the metering device, during high and low operating AC voltages, relative to its accuracy at nominal voltage.

This procedure uses the inverter over and under AC voltage trip values determined in IEEE 1547.1, Paragraph 5.2, “Test for response to abnormal voltage conditions” as reference for high and low voltage settings.

For the purpose of this test, Inverter Operating Voltage Range shall be defined as, the difference between the inverter’s high trip voltage less the inverter’s low trip voltage. For example, if a 240 V inverter is tested and its trip values are determined to be 216 V (low) and 260 V (high), the Operating Voltage Range is 44 V (260 – 216 = 44).

a) Connect the inverter according to the instructions and specifications provided by the manufacturer. Include Reference Meter between the UUT AC output and the AC power source.

b) Set all source parameters to the nominal operating conditions for the inverter (e.g. input DC voltage and current is set to the inverter’s nominal specified values).

c) Set (or verify) all inverter parameters to the nominal operating settings. If the AC overvoltage or undervoltage settings are adjustable, set the inverter to the minimum overvoltage setting, but no less than the nominal voltage plus 2x the manufacturers stated accuracy, and set the inverter to the minimum undervoltage setting.

d) Record applicable settings.

e) For single-phase units, adjust voltage to the unit's nominal value. Initiate a ramp up until the unit voltage is within 20% of the Operating Voltage Range from the high voltage trip point. For example, if the nominal voltage of the UUT is 240 V, and the high end of the Inverter Operating Voltage is 260 V, and the Operating Voltage Range is 44 V, the UUT voltage must be maintained at 251.2 V to 260 V (8.8 V is 20% of 44 V). For multiphase units, adjust voltage to unit's nominal value on all phases, and initiate the ramp up on each phase until all are within 20% of the Operating Voltage Range from the high voltage trip point.

f) After allowing the inverter output power to stabilize, record energy (kWh) from both the inverter meter and the reference meter. This voltage level will be maintained for a sufficient duration to register energy readings from both the inverter meter and reference meter.

g) Initiate a ramp down until the unit voltage is within +/- 10% of the Operating Voltage Range from the nominal inverter voltage. For multiphase units, ramp down on each phase until all are within +/- 10% of the Operating Voltage Range from the nominal inverter voltage.

h) After allowing the inverter output power to stabilize, record energy (kWh) from both the inverter meter and the reference meter. This voltage level will be maintained for a sufficient duration to register energy readings from both the inverter meter and reference meter.

i) Initiate a ramp down until the unit voltage is within 20% of the Operating Voltage Range from the low voltage trip point. For example, if the nominal voltage of the UUT is 240 V, and the low end of the Inverter Operating Voltage is 216 V, and the Operating Voltage Range is 44 V, the UUT voltage must be maintained at 216 V to 224.8 V (8.8 V is 20% of 44 V). For multiphase units, ramp down on each phase until all are within 20% of the Operating Voltage Range from the unit's low voltage trip point.

j) After allowing the inverter output power to stabilize, record energy (kWh) from both the inverter meter and the reference meter. This voltage level will be maintained for a sufficient duration to register energy readings from both the inverter meter and reference meter.

k) Initiate a ramp up until the unit voltage is within 20% of the Operating Voltage Range from the high voltage trip point. For multiphase units, ramp up on each phase until all are within 20% of the Operating Voltage Range from the high voltage trip point.

l) Repeat steps f) through k) four times, always starting at the high end of, and cycling down to the low end of the Inverter Operating Voltage Range. A total of five readings will be taken at each of the high, mid and low ends of the Inverter Operating Voltage Range.

C-4.3.1 Reporting of Data

For each of the three voltage levels, calculate and report:

- Inverter meter output energy (average of five sampled values)
- Reference meter energy (average of five sampled values)
- Meter accuracy levels (average of five sampled values)

Determine meter accuracy levels per Equation C-4-2.

C-4.3.2 Pass/Fail Criteria

Accuracies at the high and low voltage settings must be within ±2.5% of the accuracy at the nominal voltage setting. These criteria are further explained in Table C-4-2.

Table C-4-2: Effect of Variation of Voltage

Voltage Level	Permissible Deviation in Energy Reading From Nominal Voltage Level
Nominal (within 10% of the operating voltage range)	Reference
High (within 20% of the operating voltage range)	±2.5%
Low (within 20% of the operating voltage range)	±2.5%

C-4.4 Test No. 4: Effect of Variation of Frequency

C-4.4.1 Purpose

The purpose of this test is to verify the accuracy stability of the metering device during high and low operating frequencies, relative to its accuracy at nominal frequency..

a) Connect the inverter according to the instructions and specifications provided by the manufacturer. Include Reference Meter between the UUT AC output and the AC power source.

b) Set all source parameters to the nominal operating conditions for the inverter (e.g. input DC voltage and current is set to the inverter's nominal specified values).

c) Set (or verify) all inverter parameters to the nominal operating settings. If the overfrequency or underfrequency settings are adjustable, set the inverter to the minimum overfrequency and underfrequency settings.

d) Record applicable settings.

e) Adjust the source frequency to the unit's nominal value.

f) Initiate a ramp up until the unit frequency is within 2x the manufacturers stated accuracy of its maximum operating frequency.

g) After allowing the inverter output power to stabilize, record energy (kWh) from both the inverter meter and the reference meter. This frequency level will be maintained for a sufficient duration to register energy readings from both the inverter meter and reference meter..

h) Initiate a ramp down until the unit frequency is within +/- 0.1Hz of its nominal operating frequency (typically 60 Hz).

i) After allowing the inverter output power to stabilize, record energy (kWh) from both the inverter meter and the reference meter. This frequency level will be maintained for a sufficient duration to register energy readings from both the inverter meter and reference meter.

j) Initiate a ramp down until the unit frequency is within 2x the manufacturers stated accuracy of its minimum operating frequency.

k) After allowing the inverter output power to stabilize, record energy (kWh) from both the inverter meter and the reference meter. This frequency level will be maintained for a

sufficient duration to register energy readings from both the inverter meter and reference meter.

l) Initiate a ramp up until the unit frequency is within 2x the manufacturers stated accuracy of its maximum operating frequency.

m) Repeat steps f) through k) four times, always starting at the high end of, and cycling down to the low end of the manufacturers operating frequency range. A total of five readings will be taken at each of the high, mid and low ends of the range.

C-4.4.2 Reporting of Data

For each of the three frequency levels, calculate and report:

- Inverter meter output energy (average of five sampled values)
- Reference meter energy (average of five sampled values)
- Meter accuracy levels (average of five sampled values)

Determine meter accuracy levels per Equation C-4-2.

C-4.4.3 Pass/Fail Criteria

Accuracies at the high and low frequency settings must be within ±2.5% of the accuracy at the nominal frequency setting. These criteria are further explained in Table C-4-3.

Table C-4-3: Effect of Variation of Frequency

Frequency Level	Permissible Deviation in Energy Reading From Nominal Frequency Level
Nominal (within 0.1Hz)	Reference
High (within 2x manufacturers stated accuracy)	±2.5%
Low (within 2x manufacturers stated accuracy)	±2.5%

C-4.5 Test No. 5: Effect of Internal Heating

The purpose of the test is to determine any effects of internal heating on inverter meter accuracy.

a) Adjust the test environment air temperature to 23°C ± 5°C. Allow UUT to stabilize at the set temperature.

b) Connect the UUT according to the instructions and specifications provided by the manufacturer to the selected input and output power sources.

c) Set all input source parameters to the nominal operating conditions for the UUT.

d) Set (or verify) all UUT parameters to the nominal operating settings.

e) Set the UUT (including the input source as necessary) to provide 100% ± 3% of its rated output power.

f) Record all applicable settings.

g) Stage 1: Allow UUT to run at 100% ± 3% rated power for 30 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 100% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 100% ± 3%.

h) Stage 2: Allow UUT to continue to run at 100% ± 3% rated power for another 30 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 100% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 100% ± 3%.

i) Shut down input source per manufacturers recommended procedures for a duration of two hours. UUT will power down and input power source will remain powered.

j) Set the UUT (including the input source as necessary) to provide 20% ± 3% of its rated output power.

k) Record all applicable settings.

l) Stage 3: Allow UUT to run at 20% ± 3% rated power for 30 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 20% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 20% ± 3%.

m) Set the UUT (including the input source as necessary) to provide 100% ± 3% of its rated output power.

n) Record all applicable settings.

o) Stage 4: Allow UUT to run at 100% ± 3% rated power for 30 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 100% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 100% ± 3%.

C-4.5.1 Reporting of Data

For each stage of the test, calculate and report:

- Inverter meter energy (kWh) output
- Reference meter energy (kWh) output
- Meter accuracy levels

Determine meter accuracy levels per Equation C-4-2.

C-4.5.2 Pass/Fail Criteria

The UUT passes this test if meter accuracy levels are within the following ranges for each test stage:

- Stage 1: ± 2.5%
- Stage 2: ± 3.75%
- Stage 3: ± 2.5%
- Stage 4: ± 2.5%

C-4.6 Test No. 6: Stability of Performance

The inverter shall be operated continuously. The output shall begin at 10% ± 3% and ramp up in 10% ± 3% increments until 100% ± 3% is achieved. The duration of each operation interval shall be at least 24 hours. The change in percentage of performance at the beginning and end of each power level shall not vary by more than 2.5%.

It is permissible for manufacturers to perform a self-certification to this test requirement.

a) Adjust the test environment air temperature to 23°C ± 5°C.

b) Connect the UUT according to the instructions and specifications provided by the manufacturer to the selected input and output power sources.

c) Set all input source parameters to the nominal operating conditions for the UUT.

d) Set (or verify) all UUT parameters to the nominal operating settings.

e) Set the UUT (including the input source as necessary) to provide 10% ± 3% of its rated output power.

f) Record all applicable settings.

g) Run UUT at this setting for a minimum of 24 hours while recording energy (kWh) from the UUT integral meter and the reference meter. Record energy production at the beginning and end of the interval for a sufficient duration to register energy readings from both the inverter meter and reference meter.

h) Repeat steps e) through g) in steps of 10% of its rated power. Maintain an output tolerance of ± 3% at each interval (e.g. 20% ± 3%, 30% ± 3%, etc). In other words, the tolerance is *not* cumulative (e.g. 20% ± 6%, 30% ± 9%, etc).

i) Entire test shall not exceed two weeks.

C-4.6.1 Reporting of Data

For each step of the test, calculate and report:

- Inverter meter output energy (kWh) at beginning and end of each power level
- Reference meter energy (kWh) at beginning and end of each power level
- Meter accuracy levels at beginning and end of each power level

Determine meter accuracy levels per Equation C-4-2. Tabulate the meter accuracy at the beginning and end of each 10% step of inverter output.

C-4.6.2 Pass/Fail Criteria

The unit passes the test if inverter meter accuracy does not vary by more than 2.5% between the beginning and end of each 10% step of inverter output.

C-4.7 Test No. 7: Independence of Elements

The purpose of this test is to ensure the inverter meter is not registering energy output when an output phase is non-functional. This test only applies to multi-phase units (an inverter which exports power on more than two conductors). This test can be performed in conjunction with Test No. 1: No Load.

a) Adjust the test environment air temperature to 23°C ± 5°C.

b) Connect the UUT according to the instructions and specifications provided by the manufacturer to the selected output power source.

c) Set (or verify) all UUT parameters to the nominal operating settings. Temporary adjustment of UUT grid re-connections timer(s) is allowable for the duration of this test.

d) Set output power source to the UUT's rated voltage +/- 2%.

e) Set input power source to the UUT's nominal operating input voltage +/- 2%.

f) Ensure the UUT is on, with the metering circuitry active, but not producing any AC energy.

g) Record all applicable settings.

h) Disconnect one phase from the output circuit. The manufacturer can select any one phase.

i) Measure and record inverter and reference meter energy (kWh) output for a duration of 15 minutes.

C-4.7.1 Reporting of Data

For the test, calculate and report:

- Inverter and reference meter energy output. The reference meter is used to ensure no actual AC output energy has been produced.

C-4.7.2 Pass/Fail Criteria

The unit passes if the inverter meter reads 0-1% of inverter's rated energy consumption for the 15 minute duration.

C-4.8 Test No. 8: Insulation

This test is performed in conjunction with UL1741, Section 44, "Dielectric Voltage-Withstand Test" (also known as the Hypot test).

The purpose of this test is to ensure the inverter meter is still functional after the application of AC rms test potentials as defined in the UL1741 Hypot test.

Perform an Accuracy Performance Check (C-3.7) in conjunction with the UL1741 Hypot test. Ensure the pre and post measurements are recorded with the UUT at operational temperatures as specified in UL1741, Section 44.

C-4.9 Test No. 9: Voltage Interruptions

This testing is performed in two parts.

C-4.9.1 Test No. 9a: Voltage Interruptions from Short Circuits

This test is performed in conjunction with UL1741, Section 47.3, “Short-circuit test”

The purpose of this test is to ensure the inverter meter is still functional after short-circuits on both the AC and DC side of the UUT.

Perform an Accuracy Performance Check (C-3.7) in conjunction with the UL1741 Short-circuit test.

C-4.9.2 Test No. 9b: Voltage Interruptions from Loss of Control Circuit

This test is performed in conjunction with UL1741, Section 47.8, “Loss of control circuit”

The purpose of this test is to ensure the inverter meter is still functional after a control circuit loss.

Perform an Accuracy Performance Check (C-3.7) in conjunction with the UL1741 Loss of control circuit test.

C-4.10 Test No. 10: Effect of High Voltage Line Surges

This test is performed in conjunction with IEEE 1547.1, Paragraph 5.5.2, “Surge withstand performance test”.

The purpose of this test is to ensure the inverter meter is still functional after a high voltage surge.

Perform an Accuracy Performance Check (C-3.7) in conjunction with the UL1741 Loss of control circuit test.

C-4.11 Test No. 11: Effect of Variation of Ambient Temperature

The purpose of the test is to determine any effects of ambient temperature on inverter meter accuracy.

a) Obtain maximum and minimum ambient operating temperatures from manufacturer’s specifications.

b) Adjust the test environment air temperature for the reference case to 23°C ± 5°C.

c) Connect the UUT according to the instructions and specifications provided by the manufacturer to the selected output power sources. Input sources are not energized for this test. Include output reference meter in set-up.

d) Set all output source parameters to the nominal operating conditions for the UUT.

e) Set (or verify) all UUT parameters to the nominal operating settings.

f) Record all applicable settings.

g) Allow UUT to stand for not less than two hours to obtain an equilibrium temperature.

h) Connect the UUT according to the instructions and specifications provided by the manufacturer to the selected input power sources.

i) Set all input source parameters to the nominal operating conditions for the UUT.

j) Set (or verify) all UUT parameters to the nominal operating settings.

k) Set the UUT (including the input source as necessary) to provide 20% ± 3% of its rated output power.

l) Record all applicable settings.

m) Stage 1: Allow UUT to run at 20% ± 3% rated power for 60 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 20% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 20% ± 3%.

n) Set the UUT (including the input source as necessary) to provide 50% ± 3% of its rated output power.

o) Record all applicable settings.

p) Stage 2: Allow UUT to run at 50% ± 3% rated power for 60 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 50% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 50% ± 3%.

q) Shut down input source per manufacturers recommended procedure. UUT will power down and output power source will remain powered.

r) Adjust the test environment air temperature within 5°C, but not exceeding the manufacturers' high ambient temperature specification.

s) Record all applicable settings.

t) Allow UUT to stand for not less than two hours to obtain an equilibrium temperature.

u) Set the UUT (including the input source as necessary) to provide 20% ± 3% of its rated output power.

v) Record all applicable settings.

w) Stage 3: Allow UUT to run at 20% ± 3% rated power for 60 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 20% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 20% ± 3%.

x) Set the UUT (including the input source as necessary) to provide 50% ± 3% of its rated output power.

y) Record all applicable settings.

z) Stage 4: Allow UUT to run at 50% ± 3% rated power for 60 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 50% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 50% ± 3%.

aa) Shut down input source per manufacturers recommended procedures. UUT will power down and output power source will remain powered.

bb) Adjust the test environment air temperature within 5°C, but not below the manufacturers' low ambient temperature specification.

cc) Record all applicable settings.

dd) Allow UUT to stand for not less than two hours to obtain an equilibrium temperature.

ee) Set the UUT (including the input source as necessary) to provide 20% ± 3% of its rated output power.

ff) Record all applicable settings.

gg) Stage 5: Allow UUT to run at 20% ± 3% rated power for 60 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 20% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 20% ± 3%.

hh) Set the UUT (including the input source as necessary) to provide 50% ± 3% of its rated output power.

ii) Record all applicable settings.

jj) Stage 6: Allow UUT to run at 50% ± 3% rated power for 60 minutes while recording energy (kWh) from the UUT integral meter and the reference meter. Ensure power level from reference meter remains at 50% ± 3% rated power for the duration of the test. Should there be any drift, adjust input source parameters as necessary to keep the UUT operation at 50% ± 3%.

kk) Shut down input and output power sources per manufacturers recommended procedures.

C-4.11.1 Reporting of Data

For each stage of the test, calculate and report:

- Inverter meter output energy (kWh)
- Reference meter energy (kWh)
- Meter accuracy levels

Determine meter accuracy levels per Equation C-4-2 and record in format shown in Table C-4-4.

Table C-4-4: Effect of Variation of Ambient Temperature

Stage	Loading	Ambient Temperature (°C)	Meter Accuracy (%)	Deviation from Stage 1 or 2 (%)
1	20% Power			Reference for

				Stage 3 & 5
2	50% Power			Reference for Stage 4 & 6
3	20% Power			
4	50% Power			
5	20% Power			
6	50% Power			

C-4.11.2 Pass/Fail Criteria

The UUT passes this test if the conditions of Table C-4-5 are met.

Table C-4-5: Effect of Variation of Ambient Temperature Pass/Fail Criteria

Stage	Loading	Ambient Temperature (°C)	Deviation from Stage 1 or 2 (%)
1	20% Power	23 ± 5	Reference for Stage 3 & 5
2	50% Power	23 ± 5	Reference for Stage 4 & 6
3	20% Power	Within 5° of manufacturer max specified temperature	± 2.5
4	50% Power	Within 5° of manufacturer max specified temperature	± 2.5
5	20% Power	Within 5° of manufacturer min specified temperature	± 5
6	50% Power	Within 5° of manufacturer min specified temperature	± 5

C-4.12 Test No. 12: Electrical Fast Transient/Burst

The purpose of this test is to ensure the inverter meter is still functional after exposure to electrical fast/transient bursts.

Perform electrical fast transient burst testing per IEEE C37.90.1.

Perform an Accuracy Performance Check as specified in this document (C-3.7).

C-4.13 Test No. 13: Effect of Electrical Oscillatory Surge Withstand Capabilities (SWC) test

The purpose of this test is to ensure the inverter meter is still functional after exposure to electrical oscillatory surges.

Perform oscillatory SWC testing per IEEE C37.90.1.

Perform an Accuracy Performance Check as specified in this document (C-3.7).

C-4.14 Test No. 14: Effect of Radio Frequency Interference

This test is not required if the unit has been certified to FCC Part 15 compliance.

The purpose of this test is to ensure UUT meter functionality after exposure to the Radio Frequency Interference (RFI) environment specified in ANSI C12.1-2008.

Perform test exactly as specified in ANSI C12.1-2008, paragraphs 4.7.3.12 and 4.7.3.12.1, except perform Accuracy Performance Check as specified in this document (C-3.7).

C-4.15 Test No. 15: Radio Frequency Conducted and Radiated Emission

This test is not required if the unit has been certified to FCC Part 15 compliance.

The purpose of this test is to ensure UUT meter functionality after exposure to radio frequency conducted and radiated emissions as specified in the Code of Federal Regulations (CFR) 47, Part 15 – Radio Frequency Devices, Subparts A – General and B – Unintentional Radiators issued by the Federal Communications Commission (FCC) for Class "B" digital devices.

Perform test exactly as specified in ANSI C12.1-2008, paragraph 4.7.3.13, except perform Accuracy Performance Check as specified in this document (C-3.7).

C-4.16 Test No. 16: Effect of Electrostatic Discharge (ESD)

The purpose of this test is to ensure the inverter meter is still functional after exposure to ESD.

Perform the ESD test as specified in ANSI C12.1, section 4.7.3.14, "Test No. 28: Effect of electrostatic discharge (ESD).

Perform an Accuracy Performance Check as specified in this document (C-3.7).

C-4.17 Test No. 17: Effect of Operating Temperature

The purpose of the test is to determine any effects of storage temperature on inverter meter accuracy.

Perform test per IEEE 1547.1, paragraph 5.1.2.2, "Storage temperature test procedure".

Perform an Accuracy Performance Check as specified in this document (C-3.7).

C-4.18 Test No. 18: Effect of Relative Humidity

The purpose of this test is to ensure UUT meter functionality after exposure to the Relative Humidity test environment specified in UL991.

Perform a Relative Humidity test in accordance with the methods described in the Standard for Test for Safety-Related Controls Employing Solid-State Devices, UL991. The exposure class to be used is H5.

Perform an Accuracy Performance Check as specified in this document (C-3.7).

APPENDIX C-A

Table C-A-1: Inverter Meter Test Summary

Test No.	Title	Purpose of Test	Pass/Fail Criteria	ANSI C12.1 Equivalent Test No.	Series (Y/N)	Type or Production Test (T/P)
1	No Load	Ensure meter is not registering energy output when no load is on the DC input	0 ± 1% of UUT rated output	1	N	P,T
2	Load Performance	Ensure meter accuracy across the insolation spectrum quantified in the Sandia weighted efficiency test procedure (DC inputs of 10, 20, 30, 50, 75 & 100% of unit rating)	± 5% weighted accuracy across spectrum	3	N	T
3	Effect of Variation of Voltage	Verify meter accuracy during high, low and medium AC operating voltages	High and low within ± 2.5% of nominal	5	N	T
4	Effect of Variation of Frequency	Verify meter accuracy during high, low and medium operating frequencies	High and low within ± 2.5% of nominal	6	N	T
5	Effect of Internal Heating	Determine any effects of internal heating on meter accuracy	± 2.5% @ 20% & 100% output power for 30 minutes; ± 3.75% @ 100% output power for 60 minutes	11	N	T
6	Stability of Performance	Ensure meter accuracy between successive output power levels (10, 20, 30, 40, 50, 60, 70, 80, 90, 100%)	± 2.5% between beginning and end of each power level	13	N	T
7	Independence of Elements	Ensure meter is not registering energy output when one output phase is non-functional	0 ± 1% of UUT rated output	14	N	T
8	Insulation	Ensure meter accuracy after UL1741 Hypot test	± 2.5% at both 20 and 100% power levels	15	Y	T

Test No.	Title	Purpose of Test	Pass/Fail Criteria	ANSI C12.1 Equivalent Test No.	Series (Y/N)	Type or Production Test (T/P)
9a	Voltage Interruptions from Short Circuits	Ensure meter accuracy after UL1741 Short-circuit test	± 2.5% at both 20 and 100% power levels	16	Y	T
9b	Voltage Interruptions from Loss of Control Circuit	Ensure meter accuracy after UL1741 Loss of control circuit test	± 2.5% at both 20 and 100% power levels	16	Y	T
10	Effect of High Voltage Line Surges	Ensure meter accuracy after IEEE 1547.1 Surge withstand performance test	± 2.5% at both 20 and 100% power levels	17	Y	T
11	Effect of Variation of Ambient Temperature	Determine effects of ambient temperature on meter accuracy	± 2.5% @ max temp; ± 5% @ min temp	19	N	T
12	Electrical Fast/Transient Burst	Determine protection of metering device from IEC 61000-4-4 Fast Transient Surge Test	± 2.5% @ 20 and 100% rated power output between pre and post test	25	Y	T
13	Effect of electrical oscillatory Surge Withstand Capabilities (SWC) test	Determine protection of metering device from IEEE 37.90.1 Electrical Oscillatory Surge Withstand Capabilities (SWC) test	± 2.5% @ 20 and 100% rated power output between pre and post test	25a	Y	T
14	Effect of Radio Frequency Interference	Determine protection of metering device from ANSI C12.1-2008 Radio Frequency Interference (RFI) environment test	± 2.5% @ 20 and 100% rated power output between pre and post test	26	N	T

Test No.	Title	Purpose of Test	Pass/Fail Criteria	ANSI C12.1 Equivalent Test No.	Series (Y/N)	Type or Production Test (T/P)
15	Radio Frequency Conducted and Radiated Emission	Determine protection of metering device from CFR 47, Part 15 – Radio Frequency Devices, Subparts A & B	± 2.5% @ 20 and 100% rated power output between pre and post test	27	N	T
16	Effect of Electrostatic Discharge (ESD)	Determine protection of metering device from electrostatic discharge (ESD)	± 2.5% @ 20 and 100% rated power output between pre and post test	28	Y	T
17	Effect of Operating Temperature	Determine effects of operating temperature on meter accuracy	± 2.5% @ 20 and 100% rated power output between pre and post test	30	Y	T
18	Effect of Relative Humidity	Ensure meter accuracy after exposure to relative humidity environment of UL991 class H5	± 2.5% @ 20 and 100% rated power output between pre and post test	31	Y	T

APPENDIX C-B

Table C-B-1: Equations Summary

Equation ID	Standard Section ID	Equation
Equation D-3-1 Percent Registration	C-3.7 Accuracy Performance Check Procedure	Percent Registration = 100 x (Ref Meter Energy – Inverter Meter Energy)/Ref Meter Energy
Equation D-4-1 Percent Accuracy	C-4.2 Test No. 2: Load Performance	% Accuracy = 100 x (Inverter Meter kWh – Reference Meter kWh) / Reference Meter kWh
Equation D-4-4 Weighted Accuracy	C-4.3 Test No. 2: Load Performance	$\eta_{Wtd} = 100 \times (0.04 \times \eta_{10} + 0.05 \times \eta_{20} + 0.12 \times \eta_{30} + 0.21 \times \eta_{50} + 0.53 \times \eta_{75} + 0.05 \times \eta_{100})$

Appendix D: Cover Sheet for Public Utilities Code Section 2852 Documentation

Multifamily Affordable Solar Housing (MASH) Program Public Utilities Code 2852 Documentation Cover Sheet		
Complete the document and sign below. Submit this form with the MASH Reservation Request Form.		
Please select your Program Administrator		
☐ SCE	☐ PG&E	☐ CSE
List name and address of multi-family low income property.		
Property Name:		
Address:		
Section I - The low income documentation meets Public Utilities Code (PUC) 2852 low income definition under the following criteria:		
☐	A. The multifamily residential complex is **financed** with one of the following: *(If financing box is checked, please circle all modes of low income financing that apply.)* Low income housing tax credits, tax exempt mortgage revenue bonds, general obligation bonds, or local, state or federal loans or grants. ***OR***	
☐	B. The multifamily residential complex **has at least 20% of the total housing units sold or rented to lower income households for a period of 30 or more years.**	
Section II - Process for A If you **checked "A" in Section I** to indicate the project has received low income **financing**, please follow the steps below.		
1) Specify which of the following public entities or non-profit housing provider with authority to regulate affordable housing costs and/or rents the documentation comes from. *Place a check mark on the list below.*		
☐	California Tax Credit Allocation Committee (TCAC)	
☐	California Debt Limit Allocation Committee (CDLAC)	
☐	California Department of Housing and Community Development/ The California Housing Finance Agency (HCD/CALHF)	
☐	U.S. Department of Housing and Urban Development (HUD)	
☐	A Redevelopment Agency (RDA) or RDA successor agency	
☐	A Housing Authority, or a City or County in the case of a project funded by HUD HOME Funds	
1A) If the documentation is not signed by both the customer of record and one of the public entities above or non-profit housing provider, please indicate evidence that exists that the relevant affordability requirements of PUC 2852 and Health and Safety Codes referenced in the PUC code have been met for all units presented by the applicant as affordable under these code sections. Please submit related documentation to the PA.		

2) Please indicate the **compliance period in years** for which the low income restriction is in effect.	
Compliance Period Start Date:	Compliance Period End Date:
2A) Please indicate on which page of the documentation language exists that describes the compliance period.	Page:
3) Please indicate on which page of the documentation language exists that describes the **rent restriction**.	Page:
4) Please indicate on which page of the documentation language exists that defines the low income households as **no more than 80% Area Median Income (AMI)**.	Page:

Section II - Process for B

If you have **checked "B" Section I above** to indicate that **at least 20% of the total housing units are sold or rented to lower income households for a period of 30 years or more**, please follow the steps below.

1) Please indicate the page number in the documentation on which language exists that shows that the rental housing units targeted for low income occupants are **subject to a deed restriction or affordability covenant** with **a public entity or non-profit provider** organized under Section 501 (c)(3) of the Internal Revenue Code that has as its stated purpose in its articles of incorporation on file with the office of the Secretary of State to provide affordable housing to lower income households that ensures that the units will be available at an affordable rent for a period of at least 30 years. *Note: Per. D. 15-01-027, the documentation presented cannot be contingent upon participation in the CSI Low-Income programs.*	Page:

2) Specify which of the following public entities or non-profit housing providers the deed restriction or affordability covenant is signed by (it should be signed both by the customer of record and the public entity or non-profit).
Place a check mark on the low-income public entities or non-profit housing provider(s) from the list below:

☐	California Tax Credit Allocation Committee (TCAC)
☐	California Debt Limit Allocation Committee (CDLAC)
☐	California Department of Housing and Community Development/ The California Housing Finance Agency (HCD/CALHF)
☐	U.S. Department of Housing and Urban Development (HUD)
☐	A Redevelopment Agency (RDA) or RDA successor agency
☐	A Housing Authority, or a City or County in the case of a project funded by HUD HOME Funds

2A) If the deed restriction or affordability covenant is not signed by both the customer of record and one of the public entities or non-profit housing provider above, please indicate evidence that exists that the relevant affordability requirements of Public Utilities Code (PUC) 2852 and Health and Safety Codes referenced in the PUC code have been met for all units presented by the applicant as affordable under these code sections. Please submit related documentation to the PA.

2B) Explain how the low income documentation presented will be **independently enforceable and verifiable**.

3) Please indicate the **30 or more year compliance period** for which the low income units are subject to deed restriction or affordability covenant.	
Compliance Period Start Date:	Compliance Period End Date:
3A) List the page number in the documentation on which language exists that shows this restriction for a period of **at least 30 years**.	Page:
4) Please indicate on which page of the documentation language exists that defines the low income households as **no more than 80% Area Median Income (AMI).**	Page:
The undersigned declare under penalty of perjury under the laws of the State of California that 1) the information provided on this form is accurate and true; 2) the low income documentation is not contingent upon receiving MASH a rebate.	
_____ (Host Customer Signature)	_____ Date

Appendix E: Affidavit Ensuring 50% Tenant Economic Benefit

Affidavit Ensuring Minimum 50% of Economic Tenant Benefit of Allocated Solar Energy System Generation to Lower Income Households

Background: Decision (D.) 15-01-027 requires that in order to be eligible for the higher Track 1D incentive in the Multifamily Affordable Solar Housing (MASH) Program, the low income tenants at the location where the solar generating system is installed must receive at least 50% of the economic benefit of the solar generation allocated to them through virtual net energy metering through reduced or lowered energy costs.

By signing this affidavit, _____ ("Host Customer"), with respect to the solar electric system project ("System") at _____ (site address), which is partially funded by_____ (the Program Administrator for the California Solar Initiative Multifamily Affordable Solar Housing ("MASH") Program) under Application Number _____, certifies and declares under penalty of perjury under the laws of the State of California that each of the statements in the paragraphs below are complete, true and correct.

1) The Host Customer attests that they are allocating a portion of the System's electric generation to the tenant through virtual net metering and, specifically, that host customer will ensure **the tenants receive at least 50% of the economic benefit of the allocated generation of the System on a monthly basis for the life of the system or 20 years, whichever is less**.

2) If Party is using the CUAC, the Party attests that the reduced energy costs will be provided through reduced energy bills for the low income tenants.

3) The host customer agrees that the PAs reserve the right to request further documentation that demonstrates that the benefits will be passed to the tenants as provided in this affidavit.

4) The host customer selects the following option in order to guarantee at least 50% of the economic benefit of the allocated generation of the System goes to the low income tenants on a monthly basis for the life of the system or 20 years, whichever is less:

__Will use the California Utility Allowance Calculator (CUAC) or other calculator, but will not adjust the utility allowance by more than 50% of the economic benefit of the allocated generation of the System.

__Will not adjust the utility allowance.

__Other (explain)

_____

_____

By signing this Affidavit, I certify that I am authorized to sign this Affidavit on behalf of the Host Customer. I also declare under penalty of perjury, under the laws of the State of California, that all of the foregoing statements are true and correct.

HOST CUSTOMER

Signature: _____

Name Printed: _____

Title: _____

Date: _____

Appendix F: Job Training Affidavit

Instructions: Review all Multifamily Affordable Solar Housing (MASH) Program job training requirement information in this affidavit, provide all requested company information, and submit the completed and signed affidavit to the MASH administrator in the corresponding MASH project territory. Both the contractor/installer ("contractor") and the job trainee need to complete and sign this affidavit.

MASH program Job Training Requirements for Contractors

The MASH Job Training Requirements are:

- Contractors must agree to the MASH job training requirements information described below.
- Contractor's insurance must cover the employment of the MASH job training hires, including temporary hires if the job training organization/program does not provide liability coverage for its trainees.
- Contractor and MASH job trainee must complete and sign this affidavit after the installation is completed describing and verifying the job training experience.

Workforce Training Requirement & Basic Agreement

The contractor agrees to hire, in order to be eligible for a MASH incentive, at least one student or graduate of a job training program with at least one full paid day (8 hour day) of work for each 10kW (CEC-AC) of system size up to 50kW.

System Size (CEC-AC)	Job Training Opportunities (JTO)
0 -10kW	1 JTO and no less than 8 hours
10kW - 20 kW	2 JTO and no less than 16 hours
20kW - 30kW	3 JTOs and no less than 24 hours
30kW - 40kW	4 JTOs and no less than 36 hours
40kW and greater	5 JTOs and no less than 40 hours

The training can be completed on either the MASH solar installation or in a support role on the specific MASH solar project indicated in the MASH Project Address below, including but not limited to direct work on solar project installation, project design/project engineering, or project management/coordination. For time spent on each MASH installation, contractor must pay job trainee(s) at a rate consistent with the contractor's entry level or temporary worker wage. Contractor is responsible for hiring the job trainee(s) for each MASH installation and will need to provide the corresponding MASH Administrator with the names of the eligible job training program and job trainee(s) used for each MASH installation. A current contractor employee who graduated from an eligible job training program within 12 months of the MASH installation project would fulfill the workforce partnership requirement to participate as one of the trainees.

Eligible job training programs include those offered by a California Community College or other PV-training programs offered to the public by local government workforce development programs, community non-profits, private enterprises, or the electrical workers union with 40+ hours of instructional and/or hands-on PV installation and design training.

If there are differences between the MASH Handbook and this Affidavit, the MASH Handbook shall prevail.

Multifamily Affordable Solar Housing Program
Job Training Affidavit

MASH Project Information – Please type		
MASH Application No.	MASH Host Customer Name	
MASH Project Address	Project City	Project Zip

Contractor Information- Please type		
Contractor Name	Contractor CA License Number	
Contractor Address	City	Zip

Size of the MASH Project (CEC-AC kW):	**Number of Trainees:**

Job Trainee (1) Information- Please type		
Job Trainee Name		
Job Trainee Address	City	Zip
Job Trainee Phone Number	Job Trainee Email	
Job Training Organization where trainee received or currently receiving training	Job Training Organization Address	
Date of Prior Job Training Program Completion (If Already Graduated)		
Type of MASH installation work and assistance performed by the job trainee: ☐Directly worked on solar project installation ☐ Project design/project engineering ☐ Project management/coordination Notes/Other:	**Dates and Hours Job Trainee Worked on MASH Project:** Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____	

Job Trainee (2) Information- Please type		
Job Trainee Name		
Job Trainee Address	City	Zip
Job Trainee Phone Number	Job Trainee Email	
Job Training Organization where trainee received or is currently receiving training	Job Training Organization Address	
Date of Prior Job Training Program Completion (If Already Graduated)		
Type of MASH installation work and assistance performed by the job trainee: ☐Directly worked on solar project installation ☐ Project design/project engineering ☐ Project management/coordination Notes/Other:	**Dates and Hours Job Trainee Worked on MASH Project:** Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____	

Job Trainee (3) Information- Please type		
Job Trainee Name		
Job Trainee Address	City	Zip
Job Trainee Phone Number	Job Trainee Email	
Job Training Organization where trainee received or is currently receiving training	Job Training Organization Address	
Date of Prior Job Training Program Completion (If Already Graduated)		
Type of MASH installation work and assistance performed by the job trainee: ☐Directly worked on solar project installation ☐ Project design/project engineering ☐ Project management/coordination Notes/Other:	**Dates and hours Job Trainee Worked on MASH Project:** Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____	

Job Trainee (4) Information- Please type		
Job Trainee Name		
Job Trainee Address	City	Zip
Job Trainee Phone Number	Job Trainee Email	
Job Training Organization where trainee received or is currently receiving training	Job Training Organization Address	
Date of Prior Job Training Program Completion (If Already Graduated)		
Type of MASH installation work and assistance performed by the job trainee: ☐Directly worked on solar project installation ☐ Project design/project engineering ☐ Project management/coordination Notes/Other:	**Dates and hours Job Trainee Worked on MASH Project:** Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____	

Job Trainee (5) Information- Please type		
Job Trainee Name		
Job Trainee Address	City	Zip
Job Trainee Phone Number	Job Trainee Email	
Job Training Organization where trainee received or is currently receiving training	Job Training Organization Address	
Date of Prior Job Training Program Completion (If Already Graduated)		
Type of MASH installation work and assistance performed by the job trainee: ☐Directly worked on solar project installation ☐ Project design/project engineering ☐ Project management/coordination Notes/Other:	**Dates and hours Job Trainee Worked on MASH Project:** Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____ Date_____ Hours worked_____	

AFFIDAVIT

By participating in the MASH Program as a Contractor, I understand and agree to the MASH Program rules and the MASH Contractor guidelines referenced and described herein about the job training requirement.

I certify that I am authorized to sign this Affidavit. I also declare under the penalty of perjury, under the laws of the State of California, that all of the information in this Affidavit is true and correct to the best of my knowledge.

Name of Contractor Representative: _____ Title:_____

Signature (Contractor):_____ Date:_____

(Job Trainee #1)

By participating in the MASH Program as a Job Trainee, I understand and agree to the MASH Program rules and the MASH guidelines referenced and described herein about the job training requirement.

I certify that I am authorized to sign this Affidavit. I also declare under the penalty of perjury, under the laws of the State of California, that all of the information in this Affidavit as it applies to Job Trainee # 1 is true and correct to the best of my knowledge.

Name of Job Trainee _____ Title:_____

Signature (Job Trainee):_____ Date:_____

(Job Trainee #2)

By participating in the MASH Program as a Job Trainee, I understand and agree to the MASH Program rules and the MASH guidelines referenced and described herein about the job training requirement.

I certify that I am authorized to sign this Affidavit. I also declare under the penalty of perjury, under the laws of the State of California, that all of the information in this Affidavit as it applies to Job Trainee # 2 is true and correct to the best of my knowledge.

Name of Job Trainee _____ Title:_____

Signature (Job Trainee):_____ Date:_____

(Job Trainee #3)

By participating in the MASH Program as a Job Trainee, I understand and agree to the MASH Program rules and the MASH guidelines referenced and described herein about the job training requirement.

I certify that I am authorized to sign this Affidavit. I also declare under the penalty of perjury, under the laws of the State of California, that all of the information in this Affidavit as it applies to Job Trainee # 3 information is true and correct to the best of my knowledge.

Name of Job Trainee _____ Title:_____

Signature (Job Trainee):_____ Date:_____

(Job Trainee #4)

By participating in the MASH Program as a Job Trainee, I understand and agree to the MASH Program rules and the MASH guidelines referenced and described herein about the job training requirement.

I certify that I am authorized to sign this Affidavit. I also declare under the penalty of perjury, under the laws of the State of California, that all of the information in this Affidavit as it applies to Job Trainee # 4 information is true and correct to the best of my knowledge.

Name of Job Trainee _____ Title:_____

Signature (Job Trainee):_____ Date:_____

(Job Trainee #5)

By participating in the MASH Program as a Job Trainee, I understand and agree to the MASH Program rules and the MASH guidelines referenced and described herein about the job training requirement.

I certify that I am authorized to sign this Affidavit. I also declare under the penalty of perjury, under the laws of the State of California, that all of the information in this Affidavit as it applies to Job Trainee # 5 information is true and correct to the best of my knowledge.

Name of Job Trainee _____ Title:_____

Signature (Job Trainee):_____ Date:_____

Appendix G: ESA Information Notice for Tenants

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Free Energy-Efficient Appliances to Lower Your Electric Bill

Help lower your energy costs by replacing your current household refrigerator, cooling system and lighting with more energy-efficient models through the **Energy Savings Assistance Program**.

The Energy Savings Assistance Program — Easy as 1-2-3

1. **Qualification and Assessment**
   To be eligible, you must meet specific household income guidelines. After qualification, a contractor will do a walk-thru of your home to make an assessment regarding the potential installation of one or more appliances or services.
2. **Service Delivery**
   Installation and services, such as weatherization, are carried out by respected community service agencies and approved contractors.
3. **Inspection**
   An inspection may be conducted to ensure you are satisfied with the updates and to verify the installed appliances and services are working properly.

Available Appliances and Services

Cooling Systems

If your home has a working air conditioning unit, you may receive one of the following:

- A replacement, energy-efficient, central or room air conditioner, or
- An energy-efficient evaporative cooler (also called a "swamp cooler")

Note: These services may not be available in all areas.

Refrigerator Replacement

An older refrigerator can be more costly to operate. A **free** ENERGY STAR®-qualified model can be provided to you to replace a less efficient refrigerator. Plus, we'll also take the old refrigerator away for proper disposal and recycling at no charge.

Note: All replacement refrigerators meet ENERGY STAR® standards. We will install white top-freezer models without extra features, such as icemakers. Replacement size depends on the size of the old unit.

Smart Power Strip

TVs, DVRs/home theater systems, computers, printers and game consoles are just a few electronic devices that draw power even when you think they're turned off. We'll provide a **free** smart power strip to reduce your power usage by shutting down power to your devices that go into standby mode.

Pool Pump Replacement

If your home is a single-family dwelling with an in-ground swimming pool, you may be eligible for a **free** replacement pool pump that operates much more efficiently.

Weatherization Services

Households with electric space heating may receive weatherization services to help keep your home warm in the winter and cool in the summer.

Note: If your home has natural gas space heating, you should contact your local gas provider for weatherization services.

Lighting

Energy-efficient lighting and light bulbs can help conserve energy and save you money.

- **Compact Fluorescent Lights (CFLs)** may be provided as they use up to 75% less energy than ordinary incandescent bulbs and can last seven to eight times longer.
- **Replacement outdoor fixtures with CFLs** may also be provided.
- **Energy-efficient ENERGY STAR® torchiere lamps** may be provided to replace working models that use halogen or incandescent bulbs.

To apply for the Energy Savings Assistance Program, or for further information

call **1-800-736-4777**

visit **sce.com/esap**

Energy Savings Assistance Program

Certain restrictions, such as age, size and condition of the system or appliance to be replaced, may apply. The Energy Savings Assistance Program is funded by California utility ratepayers and administered by Southern California Edison under the auspices of the California Public Utilities Commission. Program funds are available on a first-come, first-served basis until funding is exhausted or the program terminated, whichever occurs first.

©2014 Southern California Edison. All rights reserved.
R-2247-V3-0814

FOR OVER 100 YEARS...LIFE, POWERED BY EDISON.

We want to help you lower your SDG&E® bill

SDGE connected
A Sempra Energy utility™

Special offer for residents of:

Authorized representatives of our Energy Savings Assistance Program are working with your property manager to offer these energy saving items to you at no cost.

- Compact Florescent Light Bulbs (CFLs)
- Faucet Aerators
- Microwaves
- LED Night Lights
- Smart Strips (also called Power Strips)
- Torchieres

These energy saving items can improve the comfort of your home and may help to lower your SDG&E bill.

How do I qualify?

You may qualify for these improvements if your household income falls within the guidelines:*

Maximum Allowable Annual Income Effective June 1, 2014 through May 31, 2015	
Household Size	Total Annual Household Income
1-2	$31,460
3	$39,580
4	$47,700
5	$55,820
6	$63,940
7	$72,060
8	$80,180
Each add'l household member, add	+ $8,120

I'm interested. What's the next step?

A program representative is scheduled to visit your home _____, between the hours of _____ – _____

If this time isn't convenient for you, contact SDG&E's Energy Savings Assistance Program at **1-866-597-0597**, to schedule a separate appointment. TDD/TTY is available at **1-877-889-7343.**

Energy Savings Assistance Program™

* As long as the residence was not previously served by the program.

The Energy Savings Assistance Program is funded by utility customers and administered by San Diego Gas & Electric under the auspices of the California Public Utilities Commission.

SDG&E makes no representations as to the safety, reliability and/or efficiency of goods and services selected. SDG&E makes no warranty whether express or implied, including warranty of merchantability or fitness for any particular purpose, use or application of selected goods and services.

P.O. Box 129831 | San Diego, CA 92112-9831 | 1-800-411-7343 | Connect at sdge.com

©2014 San Diego Gas & Electric Company. All copyright and trademark rights reserved. 5146009 0514

Save with our Energy Savings Assistance Program.

Pacific Gas and Electric Company's (PG&E) Energy Savings Assistance Program provides qualified customers with home improvements at no cost to help keep your home more energy efficient, safe and comfortable.

Your house, apartment or mobile home must be at least five years old. Both renters and owners are eligible. Common improvements may include:

- New appliances to replace your old refrigerator, furnace or water heater*
- Insulation and weatherproofing services to keep your home cooler in summer and warmer in winter
- Compact fluorescent light bulbs that use up to 70 percent less energy than traditional light bulbs

Check the chart below to see if you qualify.

INCOME GUIDELINES

Number of Persons in Household	Total Gross Annual Household Income**
1–2	$31,460 or less
3	$39,580 or less
4	$47,700 or less
5	$55,820 or less
6	$63,940 or less
7	$72,060 or less
8	$80,180 or less
For each additional person, add:	$8,120

Visit: pge.com/energysavings
or call 1-800-989-9744

TDD/TTY: 1-800-652-4712

California Relay Line:
1-800-735-2929
(If you cannot utilize the TDD line)

*Furnace and water heater repair or replacement may be available to eligible homeowners when PG&E determines existing natural gas units are inoperative or unsafe.

**Annual income before taxes.

Valid through May 31, 2015.

Energy Savings Assistance Program™

"PG&E" refers to Pacific Gas and Electric Company, a subsidiary of PG&E Corporation. ©2014 Pacific Gas and Electric Company. All rights reserved. The Energy Savings Assistance Program from Pacific Gas and Electric Company is available to selected, income-qualified customers. These offerings are funded by California utility customers and administered by PG&E under the auspices of the California Public Utilities Commission. Printed on recycled paper. Printed with soy ink.
5/14 CSR-61-4-276