CALIFORNIA
ENERGY
COMMISSION

NEW SOLAR HOMES PARTNERSHIP

GUIDEBOOK – STAFF DRAFT

JUNE 2007
CEC-300-2007-008

Arnold Schwarzenegger, *Governor*

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These guidelines were formally adopted by the California Energy Commission on December 13, 2006, pursuant to Public Resources Code Sections 25744 and 25747 Public Resources Code Section 25780 et seq., as enacted by Senate Bill 1 (Chapter 132, Statute of 2006).

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I. Introduction

The New Solar Homes Partnership provides incentives and support activities for installing eligible solar photovoltaic (PV) systems on new residential buildings[1] that receive electricity from specified investor-owned utilities. The Energy Commission implements the New Solar Homes Partnership (NSHP) in coordination with the California Public Utilities Commission (CPUC) in the overall California Solar Initiative. This Guidebook describes the requirements to receive incentives for constructing energy efficient, solar homes under the NSHP.

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A. Purpose

The goal of the NSHP is to create a self-sustaining market for solar homes where builders incorporate high levels of energy efficiency and high performing solar systems. The NSHP provides financial incentives and non-financial assistance in the form of builder and market support to accomplish this goal.

B. Program Overview

The NSHP is part of a comprehensive statewide solar program known as the California Solar Initiative (CSI). The NSHP builds on the success of the Energy Commission's Emerging Renewables Program (ERP), which began providing rebates for renewable energy systems in 1998. Senate Bill 1 (SB 1)[3] establishes three goals of the CSI: 1) to install 3,000 megawatts (MW) of distributed solar PV capacity in California by the end of 2016; 2) to establish a self-sufficient solar industry in which solar energy systems are a viable mainstream option in 10 years, and 3) to place solar energy systems on 50 percent of new homes in 13 years. The Energy Commission and the California Public Utilities Commission will each administer separate, but coordinated elements of the CSI.

The Energy Commission has been administering the NSHP program since January 2007, and envisions turning over program administration to the electric utilities or a third-party administrator by fall-2007. Any changes to the reservation process, as a result of changing program administration, will be incorporated into a revised guidebook at that time. The NSHP seeks to achieve 400 MW of installed solar electric capacity in California by the end of 2016.

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[1] Please see Section II, Program Eligibility Requirements, for the definition of new residential buildings. .
[3] SB 1 (Murray), Chapter 132, Statutes of 2006, § 4, as codified in Public Resources Code sections 25780 – 25784.

The incentive is determined by the level of an applicant's commitment to solar and energy efficiency, and by the expected performance of the system (anticipated electrical generation over the life of the system), which depends on specific key factors regarding equipment efficiency and the design and installation of the system. The incentive is paid once the system is installed, operational and has met all program requirements.

To qualify for an incentive, both the residential building and the installed PV system, must meet specific program requirements included in this Guidebook. The residential buildings must receive electricity distribution service at the site of installation from one of the four investor-owned utilities (IOUs) in California that collect funds to support the program: Pacific Gas & Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, and Golden State Water Company – doing business as Bear Valley Electric Service. The solar electric system must be 1 kW AC or larger, interconnected to the utility distribution grid and generate electricity to offset the end-use consumer's on-site electrical load. The solar electric system must be located on the same premises of the end-use consumer where the consumer's own electrical demand is located. The solar electric system must use new certified components that have not been previously placed in service and are on the Energy Commission's list of eligible equipment. The solar electric system must come with a 10-year warranty to protect against defects and undue degradation of electrical output. The electric system must be installed and field-verified by a third-party as specified in this Guidebook.

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The residential buildings must achieve energy efficiency levels substantially greater than the requirements of the current Building Energy Efficiency Standards (Standards)[4], also known as "Title 24." The builder can choose to comply with either of two tiers of energy efficiency measures:

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1) Tier I – 15 percent reduction in the residential building's combined space heating, cooling and water heating energy compared to the current *Title 24 Standards*;

2) Tier II – 35 percent reduction in the residential building's combined space heating, cooling and water heating energy and 40 percent in the residential building's air conditioning energy compared to the current *Title 24 Standards*.

In addition, for either Tier I or II, each appliance provided by the builder must be *Energy Star* if an *Energy Star* designation is applicable for that appliance.[5] Solar water heating may be used to assist in meeting the energy efficiency requirements of either Tier I or Tier II.

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[4] These Standards are specified in the California Code of Regulations, Title 24, Part 6, commencing with Section 100.

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[5] The *Energy Star* designation is available for appliances that exceed minimum federal energy efficiency standards. For more information on the *Energy Star* designation, go to www.energystar.gov .

The Energy Commission places great importance on ensuring that residential buildings, which qualify for an incentive under the New Solar Homes Partnership, are as energy efficient as possible. The Tier I level is a minimum condition of participation in the NSHP, and consistent with the energy efficiency savings needed to qualify for incentives from current residential new construction programs operated by the IOUs. The Tier II level is expected to achieve an immediate positive cash flow for homeowners and encourages builders to move toward constructing zero energy residential buildings[6], reflecting what is regularly being accomplished in California by builders that are participating in the national *Building America* program. For both Tiers, incentives to builders for delivering the required energy efficiency levels are expected to be made available through coordinated utility energy efficiency programs overseen by the CPUC, such as the residential new construction programs. Applicants should directly contact the residential new construction energy efficiency programs of their investor-owned utility to inquire about program requirements and incentives for each energy efficiency tier.

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The Energy Commission understands that the affordable housing industry often faces more difficulties in the financing and incorporation of PV systems in its developments. To address this concern, the NSHP offers an additional amount, above the standard rebate level, when specific eligibility requirements are satisfied. (See Chapter IV, Section C, for details.)

Along with the financial incentive, the New Solar Homes Partnership will provide non-financial support services, offering marketing and technical assistance to builders, as well as training to building officials and salespeople. The Energy Commission may provide greater assistance for builders choosing to build to Tier II energy efficiency levels. The Energy Commission's goal is to assist the industry to the maximum extent feasible to construct and sell new energy efficient, solar residential buildings.

The NSHP may be periodically evaluated and modified to ensure progress towards program goals. The evaluation may include: comparing the expected energy performance of systems to the actual output over time; determining the cost-benefit profile of systems; and/or assessing overall program progress towards meeting installed capacity targets. In addition, an evaluation could include investigating risks to long-term achievement of expected performance levels, such as the effects of unforeseen shading or poor system maintenance, and identifying potential actions that would reduce those risks. Lastly, the NSHP may be modified in the future to address the eligibility of solar thermal electric systems, which are potentially eligible for funding under the CSI pursuant to SB 1, Senate Bill 107[7] and Senate Bill 1250[8].

[6] The U.S. Department of Energy (DOE) Building Technologies Program defines a net zero energy building as "a residential or commercial building with greatly reduced needs for energy through efficiency gains, with the balance of energy needs supplied by renewable technologies." Source: NREL – NAHB Research Center, February 2006.

[7] SB107 (Simitian), Chapter 464, Statutes of 2006, § 7, as codified in Public Resources Code section 25744.5.

[8] SB1250 (Perata), Chapter 512, Statutes of 2006, § 11, as codified in Public Resources Code section 25744, subd. (d).

Funding for the NSHP is provided through the Energy Commission's Renewable Resource Trust Fund pursuant to Senate Bill 107, which authorizes the allocation and use of funding available for emerging renewable technologies pursuant to Public Resources Code sections 25744 and 25751 to fund PV and solar thermal electric systems in accordance with the eligibility requirements established under Senate Bill 1. Because of this, the NSHP is considered an element within the Energy Commission's Renewable Energy Program umbrella and is subject to the general administrative requirements in the Energy Commission's *Overall Program Guidebook* for the Renewable Energy Program *(Overall Program Guidebook)*.

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The *Overall Program Guidebook* describes how the Renewable Energy Program is administered. It includes information and requirements that apply overall to the Renewable Energy Program and the program elements, including information dealing with appeals, record retention, audits, and enforcement actions. To qualify for funding under the NSHP, applicants must satisfy the requirements specified in this NSHP Guidebook and the *Overall Program Guidebook.* **Applicants are strongly encouraged to read and understand their responsibilities under both guidebooks.**

The following table provides a basic summary of the NSHP program elements.

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C. Summary of New Solar Homes Partnership (NSHP) Guidebook Provisions

Program Element		New Solar Homes Partnership
Eligible technologies	•	Solar electric only
Eligible customers	•	Residential only
	•	Includes affordable housing
	•	Served by PG&E, SCE, SDG&E, and BVE
Eligible equipment		New and not previously placed in service Certified to the Energy Commission
Reservation period		18 months for base incentive 36 months for qualifying developments and affordable housing No extensions
Incentive level		Expected Performance-Based Incentive (EPBI), based on the reference system receiving $2.60/watt for production homes with solar as a standard feature, or $2.50/watt for other homes. Plus Tier I and Tier II energy efficiency funding from the utilities. EPBI for Affordable Housing is $3.50/watt for individual units and $3.30/watt for common areas..
Incentive adjustment		Volumetric trigger. Declines 10% based on original incentive level, when pre-specified target installed MW volumes are reached.
Energy efficiency requirements		Tier I - Title 24 + 15% or higher Tier II - Title 24 + 35% or higher and 40% or higher for cooling energy Energy Star for builder installed appliances Solar Water Heating can be used to meet Tiers
Incentive adjustments		EPBI - based on geographic location, orientation, tilt, shading, equipment efficiency
Verification		Systems and energy efficiency measures verified
Checkpoints		For 36 month reservations
Interconnection		Grid connected with eligible utility

(Checklist Summary has been moved to end of Guidebook)

D. Renewable Energy Credits/Certificates

When renewable electricity is generated, two commodities are created. The first commodity is the electricity, and the second is the renewable energy credits (also referred to as renewable energy certificates, or RECs) representing the non-energy, environmental attributes associated with the electricity. For purposes of the state's

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Renewables Portfolio Standard, a renewable energy credit is defined to include "…all renewable and environmental attributes associated with the production of electricity from the eligible renewable energy resource..."[9]

The Energy Commission recognizes that owners of PV systems, including those participating in the NSHP, may assert claims concerning renewable energy credits attributed to their PV systems. However, the Energy Commission has established no rules or policies governing the creation, ownership or disposition of any such renewable energy credits. The Energy Commission does not require participants of the NSHP to relinquish their claims of renewable energy credits, or to transfer ownership of any such credits to the Energy Commission or any other entity, as a condition of receiving NSHP funding.

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[9] Refer to definition in the *Overall Program Guidebook.*

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II. Program Eligibility Requirements

This section covers eligibility requirements. Eligible systems are limited to solar systems installed on new residential buildings that have achieved an Energy Commission-specified level of energy efficiency beyond that required by the current *Title 24 Standards*.

Solar systems installed on additions or alterations to existing buildings do not qualify for NSHP incentives nor do transient residences (e.g., motels, hotels). No incentive from the NSHP will be provided to any PV system servicing nonresidential portions of a development.

To be eligible for NSHP incentives, a PV system must be installed in conjunction with the construction of a newly constructed residential building that is permanently fixed to its foundation. In addition, the building permit for the solar system must be approved by the building code enforcement agency prior to the original occupancy of the newly constructed building, with original occupancy occurring on or after January 1, 2007.

Qualifying solar systems must serve newly-constructed residential buildings that are single family homes, duplexes, triplexes, condominiums, other multi-family buildings, including both "market rate" and affordable housing. **For mixed-use buildings with both nonresidential and residential occupancies, the only solar systems eligible for funding under the NSHP are those serving the residential dwelling units and common areas.**[10] Developers of such properties should contact the CPUC (www.gosolarcalifornia.ca.gov) for program eligibility. To qualify for an incentive, both the building and the PV system must satisfy specific requirements.

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A. Technology and System Ownership

A PV system that achieves the direct conversion of sunlight to electricity is the only technology eligible to receive financial incentives. Eligible PV systems must be 1 kW AC (alternating current) or larger. It is the intent of the program that eligible systems remain interconnected to the utility distribution grid and be operated for their expected economic life.

B. Residential Building Energy Efficiency

[10] The residential portion and common areas of new residential and mixed use developments are eligible for incentives. Common areas are defined as portions of a building that are intended for the common use for the primary benefit of the residential occupants of the building. Examples include, but not limited to: hallways, recreation rooms, manager unit, and tenant parking.

Eligible systems must be installed on new residential buildings that have achieved an Energy Commission specified level of energy efficiency beyond Title 24 Standards. Participating residential buildings are required to meet one of the tiers of energy efficiency shown below:

- Tier I – 15 percent reduction in the residential building's combined space heating, space cooling and water heating energy compared to the current Title 24 Standards.

- Tier II – 35 percent reduction in the residential building's combined space heating, space cooling and water heating energy and 40 percent reduction in the residential building's air conditioning energy compared to the current Title 24 Standards.

Field verification of measures will be required to be consistent with current Title 24 Standards field verification procedures and protocols. In addition, for either Tier I or II, each appliance provided by the builder must be Energy Star labeled if *Energy Star* is applicable to that appliance. Solar water heating may be used to assist in meeting the energy efficiency requirements of either Tier I or Tier II.

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C. Grid Interconnection

Eligible PV systems must be permanently interconnected to the electrical distribution grid of the utility serving the customer's electrical load. The site where the system is installed must receive electrical distribution service from an existing in-state electrical corporation collecting funds to support the program as stated in Chapter I, Section B. The system interconnection must comply with applicable electrical codes, utility interconnection requirements, and metering requirements.

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D. System Components

Major system components are defined as PV modules, inverters and meters.

All major system components must be new and must not have been previously placed in service in any other location or for any other application. **Equipment purchased or installed more than 24 months before applying for a reservation is not eligible.** The equipment must be certified to have been tested by an appropriate nationally recognized laboratory and meet specific performance criteria, as described in Appendix 3. Performance information for approved major components will be posted on the Energy Commission's lists of eligible equipment available at: [www.consumerenergycenter.org/erprebate/equipment.html].

The applicant must confirm that the components purchased for a system are eligible when applying for NSHP funding. Energy Commission staff will confirm that the equipment identified in a reservation package meets eligibility requirements prior to a reservation being granted.

Because equipment is added and removed from the eligible equipment list on a regular basis, the Energy Commission recommends the applicant wait for an approved reservation before commencing installation. If the applicant begins or completes an installation before the Energy Commission has approved the reservation, changes to the equipment lists may create a situation where significant and costly system modifications are required to comply with program guidelines.

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E. System Performance Meter

All systems must be installed with a performance meter or an inverter with a built-in performance meter so that the customer can determine the amount of energy produced by the system. The meter must be listed with the Energy Commission and measure the total energy produced by the system in kilowatt-hours (or watt hours) and have a manufacturer's accuracy specification of ±5 percent. The meter must retain the kilowatt-hour production data in the event of a power outage and must provide a display of system output that the customer can easily view and understand. A system need not include a separate meter, if the system is installed with an inverter that contains internal metering and display equipment that meets the meter requirements above. A list of eligible performance meters and inverters that have built-in meters is available at: [www.consumerenergycenter.org/erprebate/equipment.html].

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F. System Sized to Offset On-site Electricity Load

Eligible systems must be sized so that the amount of electricity that is produced offsets part or all of the customer's electrical needs at installation. Systems 5 kW or less are assumed in compliance with being sized to serve on-site electric load. For systems greater than 5 kW, only the expected performance of the system that is no more than 100 percent of the expected electrical generation needs at the site of installation is eligible for incentives. See Appendix 2 for further details on how to determine the maximum system size eligible for incentives. The minimum size of an eligible system is 1 kW AC, measured after the inverter.

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G. System Performance

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The incentive amount will be based on the estimated performance of the solar system, calculated using the Energy Commission's PV Calculator. The estimated performance of the system will be the basis for qualifying for a reservation and for the final rebate level. System installation should be consistent with the characteristics used to determine estimated performance to receive the reserved amount and is subject to available funds. The characteristics that are addressed by the PV Calculator include shading by any obstruction of the modules.

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The Energy Commission PV Calculator will include "California Flexible Installation" criteria to allow estimated performance to be based on an estimate of performance for a range of module orientations and tilts. Systems installed within the range of these orientations and tilts and meet the "minimal shading criteria" can use the California Flexible Installation criteria as the basis for the reservation application and rebate request without having to know more specific orientation, tilt and shading conditions.

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Third-party field verification will be conducted to assess whether systems have been installed consistent with the characteristics used to determine estimated performance.

H. System Installation

Systems must be installed in conformance with the manufacturer's specifications and with all applicable electrical and building codes and standards.[11]

If installed under contract, systems must be installed by an appropriately licensed contractor, in accordance with rules and regulations adopted by the California Contractors State License Board. Installation contractors must have an active A, B, C-10 , or C-46 license. Contractors with roofing specific licenses may place PV panels in accordance with limitations of their specific licenses; however, electrical connections must be made by an above-mentioned contractor. Owner-builders are permitted to install their own systems.

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The Energy Commission encourages installation contractors to become certified by the North American Board of Certified Energy Practitioners (NABCEP). See [www.nabcep.org] for additional information.

I. Field Verification

Installed systems must be third-party field-verified as described in Appendix 4 to ensure that installations are consistent with the information used to determine the estimated performance, reservations, and ultimately the final rebate. Field verification for new housing developments may employ the sampling approach described in Sections 7.5, including subsections 7.5.1, 7.5.2, and 7.5.3, of the Residential Alternative Calculation Methods Approval Manual for the *2005 Building Energy Efficiency Standards*. This information is posted on the Energy Commission's website at: [http://www.energy.ca.gov/title24/2005standards/residential_manual.html].

Field verification will check the consistency either for residential buildings that have relied upon the "California Flexible Installation" criteria and the minimal shading criteria, or for residential buildings that have uniquely specified orientation, tilt and shading characteristics. When field verification indicates that the installation will not achieve the estimated performance used for a reservation, the deficiencies must be corrected or the estimated performance must be recalculated based on the actual installation and the rebate application must be re-submitted for approval at the rebate level in effect at the time of the original reservation. When field verification indicates that the installation will achieve an estimated performance greater than that used for the reservation, the

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[11] For information on restrictions placed on owner-builders, contact the Contractors State License Board at (800) 321-CSLB to obtain a current edition of the Contractor's License Law and Handbook.

estimated performance may be re-calculated at the builder's option to reflect the higher performance, and the rebate application may be re-submitted for the incremental increased performance at the rebate level in effect at the time of the original reservation.

J. Warranty Requirements

All systems must have a minimum ten-year warranty provided in combination by the manufacturer and installer to protect against defective workmanship, system or component breakdown or degradation in electrical output of more than 15 percent from the originally rated electrical output during the ten-year period. The warranty must cover the solar generating system only, including PV modules (panels), inverters, and meters, and provide for no-cost repair or replacement of the system or system components, including any associated labor during the warranty period.

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K. Equipment Sellers

To participate in the NSHP, companies who sell system equipment must be registered with the Energy Commission and provide the following information on the Retailer Registration form, NSHP-4:

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1. Business name, address, phone, fax, and e-mail address
2. Owner or principal contact
3. Business license number
4. Contractor license number (if applicable)
5. Proof of good standing on record with the California Secretary of State, as required for corporate and limited liability entities
6. Reseller's license number

This information must be submitted before a company can become eligible to participate in the NSHP. To remain eligible, this information must be resubmitted annually by March 31. Annual submittal is required even if the information identified in the company's prior submittal has not changed. In addition, a company must submit an updated NSHP-4 form within 30 days of the date any of its reported information has changed.

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The above information must be on file with the Energy Commission before the applicant can receive any reservation confirmation or payment. The Energy Commission will compile the information and make it available to consumers to assist in making purchase decisions and seeking remedial action. Information about registered equipment sellers will be posted on the Energy Commission's website at: [www.consumerenergycenter.org/erprebate/database/index.html].

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The completed NSHP-4 form may be submitted by FAX to (916) 653-2543 or by mail to:

NSHP Seller Registration
California Energy Commission
1516 - 9th Street, MS-45
Sacramento, CA 95814-5512

III. Incentive Levels and Structure

This section describes the incentives offered by the NSHP program. The NSHP provides an Expected Performance-Based Incentive (EPBI) using a specific dollars-per-watt amount applied to the Commission-specified reference solar energy system. The incentive for each applicant solar energy system is determined by analysis using the PV Calculator, and is paid when the solar system has been installed, approved by the local building authority, and all program requirements have been met. Detailed information on how the incentive is determined can be found in Section B.

Incentives will decline over the life of the program, with the program's application process closing no later than the end of 2016.

A. Incentive Amounts and Decline Schedule

There are two available incentive levels:

- **Base incentive:** Beginning in 2007, the EPBI amount is based on the reference system receiving $2.50/watt. The base incentive applies to custom homes, small developments, reservations where solar is identified as an option, and production housing where solar will not be installed as a standard feature, as defined below. Projects qualifying for the base incentive will receive an 18-month reservation period.

- **Production housing with solar as a standard feature incentive:** Beginning in 2007, the EPBI amount is based on the reference system receiving $2.60/watt. To qualify, the builder must commit at the reservation stage that a minimum of 50 percent of the homes/dwelling units in the subdivision or multifamily housing development with 6 or more homes/dwelling units will have solar systems. Projects qualifying for this incentive will receive a 36-month reservation period.

The actual incentive for a particular system and installation depends on the EPBI calculation of the system's performance compared to the reference system. Incentive levels will decline when a specific cumulative MW volume of reservations, in terms of total-program capacity, has been reached, as reflected by the table below.

Funds reserved for systems not installed within the allowed reservation period will be reallocated to the rebate level in effect at the time those approved reservations expire or are cancelled, and the volume targets from that point forward will be adjusted to reflect the funds from the expired or cancelled reservations.

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EPBI Incentive Levels and Related Reservation Volumes

Base Incentive	Qualifying Residential Units With Solar as a Standard Feature Incentive *	Reserved Volume (MW-AC)
$2.50/watt	2.60/watt	15
$2.25	$2.35	18
$2.00	$2.10	22
$1.75	$1.85	25
$1.50	$1.60	30
$1.25	$1.35	35
$1.00	$1.10	40
$0.75	$0.85	50
$0.50	$0.60	75
$0.25	$0.35	90
Total		400
*Residential developments of 6 or more dwelling units in which 50% of homes/dwelling units have solar systems meeting at least the California Flexible Installation Criteria		

Change in Incentive Level

The Energy Commission will provide a public notice, when there will be a change in the incentive levels per the above table. The new incentive levels will be effective 30 days after the public notice. After the incentive level has been changed, the corresponding reserved volume target for the new incentive level may also be adjusted in order to maintain the overall program megawatt goals.

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B. Expected Performance-Based Incentive Calculation

The NSHP provides an incentive based on the expected performance (i.e., expected annual generated electricity), of a PV system installed in a specific location. The EPBI is determined by analysis using the PV Calculator. The analysis accounts for the tested and certified performance of the specific module and inverter, the mounting type and cell temperature, the orientation and tilt of the module, and the extent to which the system is shaded. The PV calculator accounts for these parameters that are under the control of the builder, as well as the solar and climatic conditions for the locale of the building, to determine the hourly estimated performance over a year, which is then weighted to account for the time-of-use value of the system generation to the utility system (this is referred to as time dependent valuation (TDV)).

The weighted TDV annual kWh production of an applicant system is compared to the weighted TDV annual kWh production of a reference system within the PV Calculator. The PV Calculator converts the available $/watt (PTC)[12] incentive level into the equivalent incentive amount for the TDV-weighted kWh of annual production for the reference system. This equivalent incentive per TDV-weighted kWh rate is applied to the expected annual TDV performance determined by the PV Calculator for the applicant system to determine the incentive for the specific equipment and installation characteristics of that system.

The Energy Commission uses the reference system shown in the following table.

Reference PV System and Installation

Parameters	**Reference System and Installation**
Location	San Jose (latitude, longitude, Climate Zone 4 weather file, TDV values)
Azimuth	180 degrees (south orientation)
Tilt	22.5 degrees (5:12 pitch)
Mounting	Direct mounted Building Integrated Photovoltaics (BIPV)
PV Modules	Matches Systems Installed at Premier Gardens, Sacramento
Number of Modules	
Strings (series and parallel)	
Inverter	
Shading	None
Default Losses	0.88 for dirt, dust and mismatched wiring

California Flexible Installation

In lieu of site-specific EPBI analysis as described above, the NSHP program permits applicants to use the California Flexible Installation criteria as an alternative approach to estimate the EPBI. The California Flexible Installation criteria offers a simplified approach to estimating the incentives for those solar systems in a development that are

[12] PTC refers to PV USA Test Conditions.

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<#>detailed (and tested and certified) module and inverter efficiencies;¶
<#>a default estimate of expected system power losses;¶
<#>module orientation, tilt, and mounting type;¶
<#>shading, if applicable; and¶
<#>geographic location. ¶
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The expected performance of a system is determined hourly over a year based on the specific parameters listed above, using a PV Calculator developed by the Energy Commission. The hourly expected output is then weighted to account for the time-of-use value of the system generation to the utility system for a time dependent valuation (TDV). ¶
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designed and installed to meet the criteria. One EPBI calculation can be made for all solar systems in a subdivision that meet all of the following: 1) have an azimuth ranging from 150 ^{o} to 270 ^{o}; 2) have a tilt corresponding to a roof pitch between 4:12 and 7:12; 3) meet the "minimal shading criteria" and 4) use the same models, number of modules, and inverters. The minimal shading criteria are no existing, planned or potential shading obstructions that are closer than a distance of twice the height that the obstruction extends above any point on the modules. For more information, please refer to Appendix 4, Section E.

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C. Other Incentives May Affect the Rebate Amount

Incentives received from sources other than the NSHP that lower the cost of the PV system may affect the rebate amount applicants receive from the Energy Commission. If incentives are from other utility incentive programs, a State of California sponsored incentive program, or a federal government sponsored incentive program (other than tax credits), five percent of incentives received or expected must be subtracted from the rebate amount. The percent reduction will be increased as necessary to ensure the sum of all incentives received or expected from all sources, including the NSHP, does not exceed the total cost of the system.

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The NSHP will not issue a reservation or make a payment for any system or portion of a system that has received payment from, or is eligible for and participating in, the California Public Utilities Commission-approved California Solar Initiative program, the Rebuild a Greener San Diego program, or any other rebate program for PV systems using electric utility ratepayer funds.

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IV. Reservation Process

This section describes the process required to reserve funding from the NSHP. A reservation provides assurance to builders that reserved funds will be available when a payment claim is made. Applicants eligible for the standard feature incentive will be required to submit documentation as described in Section A below. Applicants eligible for the base incentive will be required to submit documentation as described in Section B below.

A. Reservation process for projects where solar will be a standard feature

Applicants eligible for the standard feature incentive will be required to submit documentation as described below. The initial reservation approval will be conditional and will require additional information, described in Section 2 below, to be provided within six months of approval. The NSHP-2 Payment Claim Form(s) will be issued after the NSHP 1.6 Checkpoint Form and supporting documentation have been submitted. Applicants may avoid the 6-month checkpoint process if they provide the information identified in Section 2, 6-month Checkpoint, with their initial reservation. The NSHP-2 Payment Claim Form(s) will then be issued with the approval of the initial reservation application.

This reservation process can only be used by developers of 6 or more units who have committed to installing solar on 50 percent or more of all residential buildings in the development, meeting at least the California Flexible Installation criteria. Applicants meeting these criteria will receive a 36-month reservation period.[14]

To obtain a reservation, the applicant must submit one copy of each of the items described in Section 1, Initial Reservation. Application. Once the required information has been submitted and confirmed to meet the NSHP program's requirements, an NSHP-1.6 Reservation Approval and Checkpoint form will be issued to the applicant.

1. Initial Reservation Application

a) Reservation Application Form

The Reservation Application Form (NSHP-1) identifies the information needed about the proposed development and specifies what information must be submitted with the

[14] For multifamily developments to qualify for the standard incentive, they must have at least six units per development and install solar on at least 50 percent of the units.

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¶
A reservation provides the builder assurance that the reserved funds will be available when the payment claim is made. Only applicants or designated payees who submit complete reservation applications and provide all supporting documentation, as described below, will receive reservation approval. Incomplete applications – those with missing forms, omissions, or discrepancies – will not be approved and may require reapplication. The reservation ... [9]

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application. Only residential buildings receiving electrical service from one of the four eligible JOUs contributing funds to support the NSHP may receive NSHP funding. Applicants must indicate on the Reservation Application Form (NSHP-1) the electric utility that will provide electric service to the development.

b) Subdivision Map

Applicants must submit a copy of the tentative (or final, if available) subdivision map, or "tract map." Each residential building included in the reservation must be indicated as pre-plotted locations on the map for the reservation. If the residential buildings are not pre-plotted, then applicants must use the criteria outlined in Section B of this chapter.

c) Construction Plan-Set

A copy of the construction plan-set that is used for building permit purposes must be submitted. The construction plan-set must include: a) architectural floor plans, elevations and sections (should include information on windows and other measures used for the Title 24 energy calculations); b)site plan for custom homes indicating the north direction; c) electrical plans (as appropriate for Title 24 plan check) d) Mechanical plans (should include information relevant for Title 24 plan check). Additional information may be required upon request to review and complete the plan check. Applicants are encouraged to provide the construction plan-set in electronic format. The construction plan-set requirement will be waived for applicants who are participating in their electric utility's residential new construction energy efficiency program and submit proof thereof.

d) Cost Estimate for Equipment

The reservation process requires the applicant to commit to the purchase of solar equipment. The Energy Commission recognizes that builders may not have committed financially to equipment or installation at the time of the initial reservation application. However, builders must at a minimum demonstrate their interest in PV installation to the Energy Commission by providing a cost estimate from an equipment seller registered with the Energy Commission. The cost estimate must show the estimated cost per residential building where PV will be installed as well as the estimated cost for the development. Applicants should be aware that an equipment purchase agreement or invoice must be provided at the 6-month checkpoint described below. Equipment sellers must be registered as described in Chapter 2. A listing of registered sellers may be found at: [www.consumerenergycenter.org/erprebate]. Reservation requests that identify ineligible equipment sellers will not be approved until the required business information for the equipment seller is filed with the Energy Commission.

e) Expected-Performance Based Incentive Documentation

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The EPBI documentation specifies the expected performance of the PV systems to be installed on the residential buildings and the funding amount eligible to the applicant. To the extent that this varies among the residential buildings in the reservation, the information must be provided for specific residential buildings. To complete this documentation, the applicant must use the PV calculator for each unique PV system (a system is defined as one or more strings of PV modules connected to one inverter). The PV calculator will produce an output report, the CF-1R-PV. A development may use the California Flexible Installation criteria to calculate the incentives for all systems that meet the criteria.[15] In some cases, a development will have more than one PV system design that results in different levels of expected performance. In these cases, a single print out for each system design that results in a unique expected performance calculation must be submitted.

Applicants must submit each CF-1R-PV form and the associated input file in digital format for review by the program administrators and uploading into the data registry of one of the Energy Commission-approved Home Energy Rating System Program (HERS) Providers.

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f) Energy Efficiency Documentation

To participate in the NSHP, the residential buildings must also be highly energy efficient. Documentation showing energy savings for each single family home or multi-family building of at least 15 percent of the combined space heating, space cooling and water heating energy compared to the current Building Energy Efficiency Standards is required for Tier I, and at least 35 percent of the combined space heating, space cooling and water heating energy and 40 percent of the air conditioning energy is required for Tier II. Documentation must also show that for either Tier I or Tier II each appliance provided by the builder are *Energy Star* labeled if *Energy Star* is applicable to that appliance. Solar water heating may be used to assist in meeting the requirements of either Tier I or Tier II. Applicants are strongly encouraged to participate in their utility's residential new construction energy efficiency program to obtain the financial incentives that they earn for meeting either Tier I or Tier II, and to streamline the process for demonstrating that the energy efficiency requirements are met. Energy efficiency documentation submitted and approved by utility new construction programs will not have to be also submitted to the Energy Commission.

Applicants must submit the CF-1R form and the associated input file, generated directly by one of the Energy Commission-approved Title 24 compliance software programs, showing all of the measures used to meet the energy savings requirements. The CF-1R form must be consistent with the construction plan-set. Only energy efficiency documentation completed by persons who are Certified Energy Plans Examiners (CEPE) by the California Association of Building Energy Consultants (CABEC) will be accepted. For a list of CEPEs, visit the CABEC website at: [http://www.cabec.org/ceperoster.php]

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[15] The California Flexible Installation criteria offers a simplified approach to estimating the incentives for those solar systems in a development that are designed and installed to meet the criteria, as outlined in Chapter III Section B. For more information, please refer to Appendix 4, Section E.

Applicants must submit the CF-1R form and the associated input file (e.g. *.bld or *.mp7) in digital format which may be used for uploading into the data registry of one of the Energy Commission-approved HERS Providers. This step normally will be completed in conjunction with the utility new construction processes.

g) System Size Justification

As stated in Chapter II, Section F, eligible systems must be sized so that the amount of electricity produced offsets part or all of the customer's electrical needs at the site of installation. Systems 5 kW or less are assumed in compliance with being sized to serve on-site electric load. If the PV systems are above 5 kW in size, applicants must provide documentation showing that the expected annual on-site electrical load justifies the system size. Please refer to Appendix 2 for details.

2. 6 - Month Checkpoint

The 6 month Checkpoint is directed at applications for "Solar as Standard Feature" and obtaining a 36 month reservation, as described above. Those applications for the "Base Incentive" and the 18 month reservation period do not need to submit the NSHP 1.6 form, and should refer to the application instructions in Section B below.

To ensure that funding is encumbered for projects that will be completed within the reservation timeframe, applicant progress will be assessed at 6-month intervals. If the Energy Commission determines that it is not reasonable to expect the fully-reserved number of residential buildings will be completed by the end of the reservation period, it will reduce reservations as it deems appropriate,

a) Conditional Approval/6 - Month Reservation Update Form

To ensure that projects make progress on schedule and sufficient time remains to install the PV systems, the builder must complete the 6-Month Reservation Approval and Update Form (NSHP-1.6) and submit it to the NSHP Program, 6 months after the initial reservation has been approved, informing the Energy Commission of any changes (e.g., NSHP-1 changes and revised EPBI calculations) to the original Reservation Application form.

b) Equipment Purchase Agreement and Installation Contract

The equipment purchase agreement and installation contract indicate anapplicant's commitment to the purchase and installation of PV systems. The applicant must submit one master equipment purchase and installation agreement for the entire housing development or one agreement for the system equipment and a second agreement for

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the installation. These agreements must cover all residential buildings in the reservation. In cases where the installation is performed by the builder's employees, installation labor cost must be separately listed.

The master purchase agreement(s) for the equipment and installation labor must contain language indicating the builder's commitment to buy eligible PV systems for all residential buildings in the reservation and include the following information:

- List of the physical addresses for the system installations
- Quantity, make and model of modules, inverters, and meters to be installed at each address
- Total eligible system cost of equipment and/or labor.

The master purchase agreement(s) must be signed by the applicant or the applicant's representative, the seller of the systems, and the installer (an installer's signature on the equipment purchase agreement is not required if the applicant is hiring a separate company for the installation of the equipment). Purchase agreements that indicate a smaller number of residential buildings installing PV than stated in the NSHP-1 or NSHP-2 may lead to rebate amount changes.

In situations where the applicant is purchasing the system from one company and hiring a separate company for installation, the applicant must provide proof of his or her commitment to purchase and install the systems in separate documents.

An installation contract must state the price charged for the installation of equipment on a specified number of residential buildings in the housing development. Installation contracts must comply with the California Contractors State License Board (CSLB) requirements. In general, proper contracts will 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 and dollar amounts)
- Printed names and signatures of the builder and the installation company's authorized representative.

For more information on CSLB guidelines, please refer to their website at: [www.cslb.ca.gov]

The Energy Commission requires all contracted installations to be done by entities with a valid A, B, C-10 or C-46 contractor license. When systems are installed by the builder's employees, those employees are not required to be licensed. However, the Energy Commission strongly encourages installation by qualified installers since the expected performance and rebate depend on the quality of system installation.

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c) Build-Out Schedule

This schedule must include dates identifying when the PV systems have been/will be installed.

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d) Payee Data Record (Form STD-204)

The Payee Data Record must be completed by the builder if payment is to be made to the builder, or, if payment is assigned to another party, by that party. If the builder or designated payee has submitted a complete STD-204 form with a prior application and has already received a rebate payment within the past year from the Energy Commission, a new STD-204 is not needed. In these cases the Energy Commission will use data from the previously submitted STD-204 form. If the data provided in a previously submitted STD-204 has changed, the builder or designated payee must submit a new STD-204. Entities exempt from federal excise tax may not be required to provide a STD-204; applicants should check with their tax advisers.

In addition, when the payee is a corporation or limited liability entity, the payee must submit proof of good standing with the California Secretary of State.

3. Additional Reservation Status Checkpoints

To ensure projects progress on schedule and sufficient time remains to install the PV systems, the Energy Commission will conduct status checks every 6 months. In addition, the builder is required to inform the program of any changes to the above required information. The Energy Commission will reduce the amount of funding reserved as it deems appropriate, if it determines that it is not reasonable to expect the fully reserved number of residential buildings to be completed by the end of the reservation period.

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The final subdivision map, if not submitted previously, must be provided within 24 months of the initial reservation. It must include the signoff page with all applicable approvals, including those from the county record's office. The map must also show all the residential buildings where PV systems are to be installed.

B. Reservation process for projects applying for the base incentive

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The following projects are eligible for the base incentive and an 18-month reservation period. No NSHP-1.6 will be issued:

- Custom homes
- Small developments (under 6 residential dwelling units)
- Developments where solar is an option

- Developments where solar will be installed on less than 50 percent of the residential dwelling units

The following documents as described in section A must be submitted, except for the provisions stated below.

1. Reservation Application Form

2. Building Permit or Final Subdivision Map

Applicants must submit either building permits for new construction or a copy of the final subdivision map. Applications for individual houses in a development must also include a copy of the agreement between the developer and home purchaser to install a PV system. Grading permits, expired permits and permits over 3 years old are not acceptable and may not be submitted to support an application.

3. Construction Plan-Set

4. Equipment Purchase Agreement and Installation Contract

In cases where there is no signed purchase agreement, the builder may provide invoices or receipts showing at least 10 percent of the system equipment purchase price [generating equipment, inverters, and performance meter(s)] has been paid to the seller(s).

5. Expected Performance Based Incentive Documentation

6. Energy Efficiency Documentation

7. System Size Justification

8. Build-Out Schedule

9. Payee Data Record (Form STD-204)

Reservation Applications Where Solar is an Option

For applications where an applicant will be offering solar as an option to residential home buyers, the NSHP Program will reserve funding based on the solar equipment committed to be purchased for the development. If solar is an option, the reservation can only be for up to 10 percent of the residential buildings in the development. An initial NSHP-2 claim form will be issued, informing the applicant that funding has been reserved. Once a specific residential building unit (or units) has been identified to have a solar system installed, the applicant shall submit the NSHP-2 claim form back to the

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NSHP Program, with specific information about the location (address or lot number), solar equipment, and EPBI and energy efficiency documentation. Upon receipt of that information, the NSHP program will issue a NSHP-2 claim form specifically for the location or locations identified by the applicant.

C. Affordable Housing

The NSHP offers higher incentives for qualifying systems installed on affordable housing projects. Affordable housing projects of all sizes are eligible for a 36-month reservation period.

Eligible projects include multi-family and single-family developments where at least 20 percent of the project units are reserved for extremely low, very low, lower, or moderate income households for a period of at least 45 years. Qualifying systems must be connected to and serving the energy needs of 1) residential units subject to affordability requirements, 2) the office and residential unit of the project manager, provided all other residential units in the project are subject to affordability requirements, or 3) the common areas of the project, where all of the project's units are reserved for extremely low, very low, lower or moderate income households, except for the manager's unit. Examples of common areas include, but not limited to: hallways, recreation rooms, manager's unit, and tenant parking.

Mixed Use Properties

Mixed use properties are those which are comprised of residential and nonresidential units. The NSHP will fund those solar systems serving common areas and/or residential units in mixed-use affordable housing projects. No incentive from the NSHP will be provided for any PV system serving any portion of the building that is for nonresidential use, with the exception of common areas.

Incentive Levels

The following incentive levels apply to eligible affordable housing projects:

Residential Dwelling Unit System Incentive (per watt, reference system)	Common Area System Incentive (per watt, reference system)	Reserved Volume (MW-AC)
$3.50	$3.30	1.5
$3.15	$2.97	1.8

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Affordable housing developers face different processes in the purchase and installation of PV systems for their projects. To encourage affordable housing developers to include PV in their developments, the Energy Commission will accommodate their needs by providing a 25 percent higher rebate, not to exceed 75 percent of the total system cost, if affordable housing applicants meet several specific criteria. ¶

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$2.80	$2.64	2.2
$2.45	$2.31	2.5
$2.10	$1.98	3.0
$1.75	$1.65	3.0
$1.40	$1.32	4.0
$1.05	$0.99	5.0
$0.70	$0.66	6.0
$0.35	$0.33	7.0
Total		36.0

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These levels are subject to funding availability.

The table above reflects a declining incentive level as specific MW capacity has been reserved. For example, at the beginning of the program, incentives will be offered at $3.50/$3.30/watt for dwelling unit/common area systems respectively, until 1.5 MW of capacity has been reserved. At that point incentives offered will be lowered to $3.15/$2.97/watt until an additional 1.8 MW has been reserved. At the discretion of the Commission, this process will continue until total realized volume has been reserved or until funding is no longer available.

Eligible affordable housing applicants are subject to the reservation process described in Section A of this Chapter. In addition, the following documentation must be submitted in order to receive the initial reservation approval.

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1. Regulatory Agreement

The affordable housing project must be undertaken pursuant to section 50052.5, 50053, or 50199.4 of the Health and Safety Code, or other affordable housing law. Applicants must demonstrate this by providing documentation that identifies the statutory basis under which the project was undertaken. In addition, the applicant must provide a copy of the regulatory agreement or approval for the project's development that identifies 1) the project, 2) the number of residential units in the project subject to the affordability requirements, and 3) the applicable affordability requirements for these residential units. The regulatory agreement or approval must expressly limit residency in the affordable residential units to persons with extremely low, very low, lower or moderate income persons as defined by the Health and Safety Code sections 50079.5, 50105, 50106, and 50093 et seq. or regulations adopted by the California Department of Housing and Community Development.

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2. Individual Meter Requirement

Each residential dwelling unit for which a system is being installed must have an individual meter capable of monitoring and reporting the electricity consumption of that unit. If this meter is an electric utility meter, applicants must provide documentation from the electric utility confirming service and meter number. If the meter is supplied by an entity other than the utility, documentation must be provided explaining how the meter

monitors and reports individual unit consumption. Meters supplied by an entity other than a utility must be utility-grade and have the same reporting accuracy levels of utility-supplied meters. Applicants must provide documentation from the electric utility confirming service and meter number.

3. Maintenance and Monitoring Agreement

Affordable housing applicants shall provide a maintenance and monitoring plan. The plan may be submitted as a part of the reservation application or at the time the payment claim (NSHP-2) is submitted. This plan shall be a in the form of a maintenance and monitoring contractual agreement, that specifies that the system will regularly be serviced and maintained for the life of the system. The maintenance and monitoring contract shall include scheduled annual or semiannual maintenance visits, during which the service provider must at a minimum carry out the following activities: a) Clean the module array of any dirt and dust build up; b) Check all electrical connections for corrosion and erosion; c) Check the inverter for instantaneous power and long term energy output and diagnose and take corrective action needed if production is significantly lower than expected; and d) Check for any tree/plant growth or other obstructions that are causing shading on the array and take action to eliminate that shading.

D. Additional Information on Reservations

Funding is available on a first-come, first-served basis for applicants who submit complete and approved applications. Only one reservation and one rebate payment will be allowed for each residential dwelling unit during the reservation period[16]. Applicants will not be allowed to submit multiple reservation applications for the same residential dwelling unit.

Only applicants or designated payees who submit complete reservation applications and provide all supporting documentation will receive reservation approval. In applications with only minor omissions or discrepancies that do not affect eligibility or the amount reserved, the Energy Commission/administrator *may* request clarification of information. If the additional information is not supplied within the stated timeframe, the applicant may be notified to reapply.

No funding will be reserved if an application is incomplete or illegible, has conflicting information or does not otherwise comply with the program requirements. Incomplete applications will not be approved and may require reapplication. If an applicant re-applies, the complete reservation application and all supporting documentation must be

[16] An applicant may only cancel their reservation and re-apply for a new one within the original reservation period if the rebate has dropped at least one level from the rebate granted in the original reservation. A letter explaining the request must be submitted with a new Reservation Application Form signed by the builder. This is designed to discourage applicants from applying too early in the construction process for a system to be installed within the reservation period.

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To participate in the NSHP, the residential buildings must also be highly energy efficient. Documentation showing energy savings for each single family home or multi-family building of at least 15 percent of the combined space heating, space cooling and water heating energy compared to the current Building Energy Efficiency Standards is required for Tier I, and at least 35 percent of the combined space heating, space cooling and water heating energy and 40 p ... [18]

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submitted as one package. Any new application will be subject to the program requirements and funding availability in effect at the time of the new submission.

The complete reservation application and all supporting documentation must be submitted together. While information sent in after the initial application may be matched to the application, this is not guaranteed.

Information provided in the application and supporting documentation must be consistent throughout. Applicants should check to ensure all names and addresses are the same throughout all documentation or provide an explanation if they are different. Failure to do so may result in delays or application rejection.

An application will be approved for a reservation based on the date it is deemed complete, not the date it was first submitted. The rebate level and other program criteria applicable on the date the application is deemed complete will apply. **Applicants are strongly encouraged to keep copies of all applications and supporting documentation submitted to the Energy Commission.**

Because the available rebate amount changes during the term of the program, the Energy Commission recommends that applicants not start construction on participating residential buildings and system installations until they receive a confirmation indicating the amount of funding that has been approved for their reservation.

E. Where to Send Reservations

The complete reservation application must be delivered by FAX to (916) 653-2543 or by mail to:

NSHP Reservation Request
California Energy Commission
1516 - 9th Street, MS-45
Sacramento, CA 95814-5512

If the application is mailed close to the date of a scheduled rebate level decline, the application must be postmarked no later than the last day before the scheduled rebate decline to be considered for the higher rebate level.

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Information provided in the application and supporting documentation must be consistent throughout. Applicants should check to ensure all names and addresses are the same throughout all documentation or provide an explanation if they are different. Failure to do so may result in delays or application rejection. If the reservation package is missing required forms or has omissions or discrepancies, the applicant will be notified that the application has been rejected. Any new application will be subject to the program requirements and funding availability at the time of the new submission.¶
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Deleted: No funding will be reserved if an application is incomplete or illegible, has conflicting information or does not otherwise comply with the program requirements. The incentive for applications that include residential buildings of both tiers of energy efficiency will be prorated. An application will be approved for a reservation based on the date it is deemed complete and not the date it was first submitted. The rebate level and other program criteria applicable on the date the application is deemed complete will apply. **Applicants are strongly encouraged to keep copies of all applications and supporting documentation submitted to the Energy Commission.**¶
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Because the available rebate amount changes during the term of the program, the Energy Commission recommends that applicants not start construction on participating residential buildings and system installations until they receive a confirmation indicating the amount of funding that has been approved for their reservation. The applicant can track the status of the application at [www.gosolarcalifornia.ca.gov].

V. Payment Process

This section describes the process required to claim funding from the NSHP. It is currently based upon the current (pre-2007), payment process for the Emerging Renewables Program, administered by the Energy Commission. The Energy Commission is considering an alternative administrative structure in the future. Any changes to the payment process will be incorporated into a revised guidebook at that time.

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To receive the rebate payment, the PV system must be installed, grid-connected, and operating satisfactorily. With the system operating, applicants must then complete the payment claim form and provide all supporting documentation below before the reservation expires; otherwise, if the reservation expires, the applicant will be required to reapply under program eligibility requirements and rebate levels current at the time of the reapplication.

A. Payment Claim Documentation

1. Payment Claim Form

Upon reservation approval, the Energy Commission will send a copy of the Payment Claim Form (NSHP-2) to the builder and equipment seller for each PV system being installed to confirm, the amount of funding reserved on the builder's behalf.

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In most cases, the parties entering into the equipment purchase agreement and installation contract(s) (builder and equipment seller and/or installer) must read, sign, and date the Payment Claim Form. In cases where builders buy equipment from a PV manufacturer or wholesaler and install the equipment themselves, only the builder must sign the form.

Any changes to the information provided on the previously submitted Reservation Application Form (NSHP-1), such as the use of different equipment, a different installer or a different equipment seller, must be noted in the space provided on the Payment Claim Form (NSHP-2). If additional space is needed to note such changes, additional pages may be attached to the Payment Claim Form. Please see Appendix 1 for information on how reservation changes may affect application eligibility or the rebate amount.

The Payment Claim Form and all the documentation listed below must be returned to the Energy Commission by mail, as original signatures are required to process a payment claim for an installed PV system. The Energy Commission encourages applicants to sign with an ink that is clearly distinguishable as original. In some cases, applicants may be asked to return a new form with clearly original signatures. Stamped signatures will not be accepted.

2. Documentation Confirming Payment

Applicants must submit final system cost documentation clearly identifying the final amount paid or legally incurred by the applicant for payment to the equipment seller and/or installer to purchase the system and the final amount paid to install the system. The final amount paid or legally incurred for payment to the equipment seller and/or the final amount paid or legally incurred for payment to the installer must match the cost information identified in the Payment Claim Form.

To meet this requirement, the applicant must submit final invoices or a copy of the final agreement. The actual amount paid or legally incurred for payment by the builder to the equipment seller and/or the actual amount paid or legally incurred for payment to the installer must be clearly indicated. In addition, the final invoices or agreements must clearly indicate the extent to which the Energy Commission's rebate lowered the cost of the system for the applicant. If the applicant has entered into an agreement to pay the equipment seller over time rather than in a lump sum, the final agreement must also include the terms of payment and the amount of any deposits or payments paid by the applicant to the equipment seller to date.

The Energy Commission will conduct spot checks to verify that payments were made as identified in the final invoices or agreements provided by equipment sellers and/or installers. As part of these spot checks, the Energy Commission 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 installer. (When submitting this documentation, applicants are encouraged to remove their personal account numbers or other sensitive information identified in the documentation.) 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 Application Form (NSHP-1).

3. Final Building Permit and Final Inspection Sign Off

Applicants must submit a copy of the building permit and the final inspection signoff for the system installation prior to the expiration date of the reservation. The builder name and address on the final building permit and final inspection signoff must match the name and address shown on the Payment Claim Form (NSHP-2) and the previously submitted Reservation Request Form.

4. Expected Performance Based Incentive (EPBI) Documentation

Applicants must submit copies of a Certificate of Field Verification and Diagnostic Testing (CF-4R-PV) for each system for each residential building consistent with the procedures in Appendix 4. When the field verification and diagnostic testing is performed using the sampling approach, builders must submit only a CF-4R-PV for

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each system for each residential building that is sample tested for a group of up to seven units for which compliance was verified based on the results of the sample. Builders may be required to provide copies of Certificates of Field Verification and Diagnostic Testing for other residential buildings in the group upon request. HERS raters must be certified and work under the oversight of one of the Energy Commission approved HERS providers – California Home Energy Efficiency Rating Services (CHEERS), California Certified Energy Rating & Testing Services (CalCERTs) or California Building Performance Contractors Association (CBPCA). Web links to these providers can be found on the Energy Commission Website: [www.energy.ca.gov/HERS/]. The CF-4R-PV form must be generated through the data registry system of a Commission-approved HERS provider. To enable the HERS rater to make the field verifications, the builder must submit each CF-1R-PV form and the associated input file in digital format for uploading into the data registry of one of the Commission-approved HERS providers, and the builder must provide the HERS rater with the CF-6R-PV form, the site plan, and the solar system information specified in Section 3D of Appendix 4 for each residential building. In cases where the CF-4R-PV shows that the installed solar system is not consistent with CF-1R-PV that has been previously submitted to the Energy Commission, a revised CF-1R-PV shall be prepared and submitted that is consistent with the as-installed conditions. When such an inconsistency is found when the sampling approach is used, revised CF-1R-PVs shall be prepared for all systems in the group that was sampled, consistent with the Energy Commission's re-sampling and corrective action procedures. Applicants may be required to submit Installation Certificates (CF-6R-PVs) to the Commission upon request.

5. Energy Efficiency Documentation

The requirements for energy efficiency documentation in conjunction with the payment claim are conceptually the same as for EPBI documentation. Those requirements in the context of the energy efficiency documentation are specified here for clarity.

Applicants are strongly encouraged to participate in their utility's new construction program to obtain the financial incentives that they earn for meeting either Tier I or Tier II, and to streamline the process for demonstrating that the energy efficiency requirements have been met. Energy efficiency documentation submitted and approved by utility new construction programs will not have to be also submitted to the Energy Commission.

Applicants must submit a copy of the Certificate of Field Verification and Diagnostic Testing (CF-4R) for all energy efficiency measures installed to meet either Tier I or Tier II. When the field verification and diagnostic testing is performed using the sampling approach, builders must submit only a CF-4R form for each residential building that is sample tested for a group of up to seven units for which compliance was verified based on the results of the sample. Builders may be required to provide copies of Certificates of Field Verification and Diagnostic Testing for other residential buildings in the group upon request. HERS raters must be certified and work under the oversight of one of the Energy Commission approved HERS providers – CHEERS, CalCERTs or CBPCA. Web

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links to these providers can be found on the Energy Commission Website: [www.energy.ca.gov/HERS/]. The CF-4R must be generated through the data registry system of a Commission-approved HERS provider. The HERS rater must verify the presence of all energy efficiency measures installed to meet either Tier I or Tier II. To enable the HERS rater to make these field verifications, the builder must submit each CF-1R form and the associated input file in digital format for uploading into the data registry of one of the Commission-approved HERS providers. The builder must provide the HERS rater with the CF-6R for each residential building. Applicants may be required to submit Installation Certificates (CF-6R-PVs) to the Commission upon request.

6. Ten-Year Warranty

A standard ten-year warranty form (NSHP-3) must be completed and signed by the appropriate party(ies) and given to the builder to compile as part of the payment claim package.

7. System Interconnection with Utility Grid

The applicant must demonstrate that the system is interconnected to the utility distribution grid, and that the utility has approved the system's interconnection to the utility grid from the site of installation. The applicant must demonstrate this by submitting a letter of authorization to interconnect the system from the utility. By providing the utility's letter of authorization to interconnect, applicants will not be required to submit proof of electrical connection.

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By applying for program funding, builders authorize the Energy Commission during the term of the NSHP to obtain information from the utility serving the project in order to verify compliance with program requirements, including requirements for system interconnection to the utility grid. In addition, the builder must forward new homeowner contact information when requested by the Energy Commission.

B. Assignment of Rebate Payment

The applicant may assign his or her right to receive the payment to another party by completing the Rebate Payment Claim Form (NSHP-2) and submitting it with the payment claim package. The Rebate Payment Claim Form may not be submitted by fax as original signatures are required to process the assignment. Applicants that assign their rebate payment to another party will still be reported as the recipients of said payments for tax purposes.

C. Payment Claim Submission

Applicants must mail the complete payment claim package to the Energy Commission at the address below on or before the expiration date specified on the Rebate Payment Claim Form. Payments will be provided for each claim form submitted. Payment claims may be made for individual buildings or groups of buildings. Reservation-holders are not required to have completely installed all systems in their reservations before submitting a claim form. **Applicants are strongly encouraged to keep copies of all documents submitted in the payment claim package to the Energy Commission.**

If the payment claim package is incomplete, the Energy Commission will request the applicant to provide all missing or unclear information; the applicant will be responsible for obtaining missing or revised information from the equipment seller or installer to process the request. The Energy Commission will allow the applicant up to 60 days to respond with corrections to all the missing or unclear information to approve payment.

If the claim is made after the expiration date of the reservation or is otherwise ineligible, the applicant may reapply for a rebate reservation but will be subject to the program eligibility requirements, rebate levels, and funding available at the time of the re-application.

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Mail the complete payment claim package to:

NSHP Payment Claim
California Energy Commission
1516 9th Street, MS-45
Sacramento, CA 95814- 5512

The Energy Commission intends to make payments within 6 to 8 weeks of receipt of a complete payment claim package. Payment will be made to the payee and mailed to the address of the payee specified on the Reservation Application Form (NSHP-1) and Payee Data Record. If the applicant has assigned the payment to another party, payment will be made to the assigned payee and mailed to the address of the payee specified on the Rebate Payment Claim Form.

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D. Claiming a Rebate Payment Without a Prior Reservation

If a rebate payment is claimed for a system not previously approved for a reservation, the completed payment claim package must be accompanied by a completed reservation package. Applicants without a prior reservation should be aware that program eligibility requirements and rebate levels may have changed since the system installation and may cause the applicant to make significant and costly changes to the system in order for it to qualify for an incentive.

Appendix 1 – Frequently Asked Questions

A. Can My Installed System Be Different Than My Reservation?

The Energy Commission expects a system to be installed as described in the Reservation Application Form (NSHP-1), but recognizes that changes may occur during installation. Changes do not require prior approval, but must be documented on the Payment Claim Form (NSHP-2) and are likely to change the rebate amount. Changes that result in a lowering of the expected performance of a system, and thereby lowering rebate amounts are not a problem. However, any change that increases the expected performance of a system, and thereby increasing the rebate amount is subject to availability of funding. The builder may receive the incremental increase in the eligible rebate at the time the claim is received.

Modifications to an approved reservation may be made prior to a payment claim or when the complete payment claim is submitted. When a modification increases the expected performance of the system, a new incentive amount will be calculated based on the time a modification request, with supporting documentation, is deemed complete. If reservations at that time exceed available funding, the incremental increase in expected performance will earn the rebate amount in effect at the time of the modification.

If any system change occurs or is determined by the field verification that decreases the expected performance below that used in the reservation, the rebate is based on the lower expected performance. If any system change occurs or is determined by the field verification that increases the expected performance above that used in the reservation, the applicant may complete the Rebate Payment Claim Form based on the higher performance (subject to the available funding stipulation above).

If the applicant uses the “California Flexible Installation” criteria and the minimal shading criteria, the builder may complete the Rebate Payment Claim Form using the expected performance used for the reservation as long as the orientation, tilt and minimal shading criteria are determined to be met by the field verification. The applicant also has the option of recalculating the rebate based on the actual orientation and tilt of the system as determined by the field verification. If the field verification determines that the “California Flexible Installation” criteria and the minimal shading criteria are not met, the expected performance will be re-calculated based on the actual orientation, tilt and shading.

B. Can Builders Add to Their Existing Systems?

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PV system sellers or contractors (e.g., retailers, wholesalers, and manufacturers) may not sell a system to themselves. To receive an incentive, a purchase agreement (or proof of purchase) must be between the builder and the system supplier. The supplier must be identified as the seller on the application form and must be registered with the Energy Commission. Documentation of a purchase between two principals or owners within the same entity or between spouses is not acceptable, nor is a purchase agreement if signed by the same individual. ¶
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Once rebates are paid, changes to expand or otherwise improve the expected performance of a system(s) are not eligible for NSHP funding. Homeowners may apply to the California Solar Initiative Program administered by the Public Utilities Commission. See [www.gosolarcalifornia.ca.gov] for additional information and requirements.

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C. Can I Get a Time Extension?

No time extensions will be granted to existing reservations under any circumstances.

Appendix 2 – System Size Justification

This Appendix describes the method used to determine the maximum system size eligible for incentives from the program. Because the average annual residential electricity consumption in California is about 7000 kWh/yr, systems that are 5 kW and under are automatically presumed in compliance with the maximum size limitation.

In cases where the proposed system size is greater than 5kW, the system must be sized such that the expected performance, defined as expected annual generation of the system is no greater than 100 percent of the residential building's on-site estimated annual electricity consumption. The applicant may submit either the estimated annual electricity consumption of the residential unit based on a detailed energy use calculation signed by a Certified Energy Plans Examiner (CEPE) or a letter from a qualified architect, engineer, or electrical contractor (C-10 licensed) licensed by the State of California detailing expected energy consumption.

The Energy Commission will use the expected system electricity production from the EPBI calculation and compare it to the expected energy consumption. In cases where the expected electricity production is greater than 100 percent of the estimated annual consumption, the rebate will be based on the estimated annual consumption.

Appendix 3 – Criteria for Testing, Certification and Listing of Eligible Components

This Appendix summarizes the criteria used for determining which components can be used to create a PV system that is eligible for a rebate from the New Solar Homes Partnership. Certified equipment (solar modules, inverters, and performance meters) is periodically added to and removed from the lists of eligible equipment.

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The equipment must be certified to meet nationally or internationally recognized standards, information submittal requirements, and other criteria specified by the Energy Commission to be listed. Until the equipment is listed it is not eligible, and no funding can be reserved or payment made.

If a component becomes decertified as a result of failing to meet the testing requirements described below, and is removed from the Energy Commission's lists of eligible components, applicants may be required to modify their systems by replacing the decertified component with a certified component before payment is issued.

A. Photovoltaic Modules

All flat plate PV modules must be certified by a nationally recognized testing laboratory as meeting the requirements of and being listed to be in conformance to the Underwriters Laboratory (UL) Standard 1703 and any subsequent testing standard adopted by UL.

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All flat plate PV modules must also be tested by a laboratory accredited by the International Laboratory Accreditation Cooperation according to the following sections of either the International Electrotechnical Commission Standard 61215, *Crystalline Silicon Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type* Approval*, Second Edition 2005-04*, or the International Electrotechnical Commission Standard 61646, *Thin-film Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval, First Edition, 1996-11*, except as specified in Notes 3, 6 and 7 of Table 1 below.

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IEC Standard 61215 Sections

- 10.2 Maximum Power Determination
- 10.4 Measurement of Temperature Coefficients
- 10.5 Measurement of Nominal Operating Cell Temperature (NOCT)
- 10.6 Performance at STC and NOCT
- 10.7 Performance at Low Irradiance

IEC Standard 61646 Sections

- 10.2 Performance at STC

10.4 Measurement of Temperature Coefficients
10.5 Measurement of Nominal Operating Cell Temperature (NOCT)
10.6 Performance at NOCT
10.7 Performance at Low Irradiance
10.18 Light-Soaking

The following performance data and information must be provided and certified to the Commission. Data for a module may be provided based on testing of a module that is a similar design and type with variations that do not significantly affect performance, if the manufacturer certifies that test results for all specified parameters in Table 1 for both modules would not be significantly different. Data submitted to the Energy Commission will be made public.

The factory measured maximum power of each production module, as specified in UL 1703, Section 44.1, and the lower bound of the manufacturer's stated tolerance range, pursuant to UL 1703, Section 48.2, must be no less than 95% of the Maximum Power reported to the Energy Commission.

Table 1. Module Performance Parameter Testing

Parameter	**Symbol**	**Units**	**Notes**
Maximum Power	P_{mp}	Watts	1, 7
Voltage at maximum power	V_{mp}	Volts	1, 7
Current at maximum power	I_{mp}	Amps	1, 7
Open Circuit Voltage	V_{oc}	Volts	1, 7
Short Circuit Current	I_{sc}	Amps	1, 7
Nominal Operating Cell Temperature	NOCT	°C	3, 7
Temperature Coefficients	β_{Voc} (at V_{oc}) β_{Vmp} (at V_{mp}) α_{Isc} (at I_{sc}) α_{Imp} (at I_{mp}) γ_{Pmp} (at P_{mp})	%/°C	2, 7
Voltage at maximum power and low irradiance	V_{low}	Volts	4, 6
Current at maximum power and low irradiance	I_{low}	Amps	4, 6
Voltage at NOCT	V_{NOCT}	Volts	5, 6
Current at NOCT	I_{NOCT}	Amps	5, 6

Notes:

1) Values shall be measured at Standard Test Conditions after Preconditioning according to IEC Standard 61215, Section 5, or after Light-soaking according

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to IEC Standard 61646, Section 10.18.

2) Values shall be measured and calculated according to IEC Standards 61215 and 61646, Section 10.4.
3) Value shall be measured according to IEC Standards 61215 and 61646, Section 10.5.2. For BIPV modules the measurements shall be made using the mounting specified below. Prior to January 1, 2008 manufacturers may provide NOCT values for BIPV modules that are not tested according to IEC Standards 61215 and 61646 with the mounting below; these values for performance calculations will be adjusted by adding 20 ^{o} C to be consistent with the Sandia National Laboratories Report, *A Simplified Thermal Model for Flat-Plate Photovoltaic Arrays* by Martin K. Fuentes, 1987, page 11, Table 4.
4) Values shall be measured at low irradiance according to IEC Standards 61215 and 61646, Section 10.7.
5) Values shall be measured at NOCT according to IEC Standards 61215 and 61646, Section 10.6.
6) Prior to January 1, 2008 provision of this data is optional.
7) Prior to January 1, 2008 manufacturers will provide this data based on IEC Standard 61215 or IEC Standard 61646 if available or based on test procedures specified in UL 1703, Section 18.1 (in-house laboratory and flash test data is permissible prior to January 1, 2008), if testing for the module according to one of these IEC Standards has not been completed.

Mounting Specifications for NOCT testing for Building Integrated Photovoltaic (BIPV) Modules Intended for Roof Integrated Installations:

Tilt angle: the test modules shall be positioned so that they are tilted at 23 ^{o} ± 5 ^{o} (5:12 roof pitch) to the horizontal.

Configuration: the test modules shall be located in the middle of an array that is at least four feet high and four feet wide. The array shall be surrounded on all sides with a minimum of three feet of the building system for which the BIPV system is designed to be compatible, and the entire assembly shall be installed and sealed as specified by the manufacturer for a normal installation.

Substrate and Underlayment: the test modules shall be installed on a substrate of oriented strand board with a minimum thickness of 15/32 inch that is covered by #30 roofing felt with a minimum R-10 continuous insulation under and in contact with the oriented strand board and include any other manufacturer-recommended underlayments.

B. Inverters

All inverters must be certified as meeting the requirements of UL 1741. Each model of inverter must be tested by a qualified Nationally Recognized Test Laboratory[17] to be eligible for this program. Performance ratings for each model will be determined according to sections of the test protocol entitled, *Performance Test Protocol for Evaluating Inverters Used in Grid-Connected Photovoltaic Systems*, prepared by Sandia National Laboratories, Endecon Engineering, BEW Engineering, and Institute for Sustainable Technology, October 14, 2004 version[18] and the "Guidelines for the Use of the Performance Test Protocol for Evaluating Inverters Used in Grid-Connected Photovoltaic Systems." This version of the test protocol and guidelines are available on the Energy Commission website at [http://energy.ca.gov/renewables/02-REN-1038/documents/2004-12-01_INVERTER_TEST.PDF]. The tests must be performed in accordance with sections 3, 4, 5.1 and 5.2 of the test protocol, as further clarified in the guidelines. The following tests are required:

- **Maximum Continuous Output Power.** Section 5.4 shall be performed in its entirety for test condition A of Table 5-2 with the following exceptions: 1) the test shall be performed at an ambient temperature of 40°C, rather than 45°C, and 2) the dc V_{nom} may be selected by the manufacturer at any point between V_{min} +0.25* (V_{max} -V_{min}) and V_{min} +0.75* (V_{max} –V_{min}). It is not necessary to perform Section 5.4 for test conditions B through E of Table 5-2.

- **Conversion Efficiency.** Section 5.5 shall be performed for test conditions A, B and C of Table 5.3, subject to the following: 1) the tests shall be performed with dc V_{nom} equaling the same voltage as selected above for the Maximum Continuous Power Output test, 2) steps 1 through 8 of the test procedure (Section 5.5.1) shall be performed at 25°C, and not at 45°C, and 3) to reduce time for each test condition, begin at the highest power level and go to the lower power levels. If done in this order it will only be necessary to wait for temperature stabilization at the 100 percent power level. In addition, the unit only needs to be operated at full output power for one hour, rather than 2.5 hours, and no preheating is necessary if the Conversion Efficiency test is performed within 1 hour of full operation under test 5.4 provided the unit has not been exposed to ambient temperature of less than 22 °C.

- **Tare Losses.** Section 5.7.1 shall be performed in its entirety. It is not necessary to perform the tests under Section 5.7.2 or Section 5.7.3.

All of the above data will be used as inputs for the Commission's PV Calculator.

[17] Nationally Recognized Testing Laboratories shall be those laboratories that have been recognized by the U.S. Department of Labor, Occupational Safety & Health Administration (OSHA), in accordance with Title 29 of the Code of Federal Regulations, section 1910.7, and are approved to conduct test UL 1741 under the scope of their OSHA recognition. A list of all current Nationally Recognized Testing Laboratories is available on OSHA's web page at [www.osha.gov/dts/otpca/nrtl/index.html]. Please note, not all of the Nationally Recognized Testing Laboratories identified on OSHA's list are approved to conduct test UL 1741.

[18] This version of the test protocol is identified by the file name "InvertrTestProto_041014.doc" as shown in the left-hand side of the footer on each page of the protocol.

Please note that the tests for Power Foldback (Section 5.8) and Inverter Performance Factor/Inverter Yield (Section 5.9) are NOT required.

The data and reports resulting from the tests for Maximum Continuous Output Power (Section 5.4), Conversion Efficiency (Section 5.5) and Tare Losses (Section 5.7.1) must be provided to the Energy Commission and will be made public. The inverter tested must utilize the same hardware and software configuration evaluated during the UL 1741 certification test.

The methodology for rating inverters on the Energy Commission list is based on the weighted inverter efficiency measured at various load points. Weighting inverter efficiency will be determined with the following weighting factors:

DC Input Power Level	Weighting Factor
10%	0.04
20%	0.05
30%	0.12
50%	0.21
75%	0.53
100%	0.05

The Energy Commission also plans to consider if changes should include adjusting the ratings for inverters with battery-backup to account for losses inherent in battery back-up systems.

To qualify for the NSHP, PV systems must have an inverter that has a built in meter that measures and displays output AC power.

C. Metering Criteria

Performance meters or inverters with a built-in meter must be easy to read for the customer's benefit and be listed with the Energy Commission. The meter must measure the total energy produced by the system in kilowatt-hours (or watt hours) and have a manufacturer's uncertainty specification of plus or minus five percent. The meter must retain the kilowatt-hour production data in the event of a power outage.

Appendix 4 – Field Verification and Diagnostic Testing of Photovoltaic Systems

A. Background

The New Solar Homes Partnership (NSHP) provides incentives to builders for installing high performance PV systems on energy efficient homes. The NSHP bases the incentive on a determination of the expected performance of the solar system, which accounts for the tested and certified performance of the specific module and inverter, the mounting type and cell temperature, the orientation and tilt of the module and the extent to which the system is shaded. The PV calculator developed by the Energy Commission accounts for these parameters that are under the control of the builder, as well as the solar and climatic conditions for the locale of the building to determine hourly estimated performance, which is weighted to account for the time-dependent valuation of the electricity that is produced. Third-party field verification must be conducted to ensure that the components of the solar system and its installation are consistent with the characteristics used to determine its estimated performance. Field verification is a value-added service paid for by the builder that provides quality control that protects the builder, installer, supplier, homeowner and California as a whole. The costs of field verification are paid by the builder under the New Solar Homes Partnership rebate program. Field verification is completed consistent with the procedures of Chapter 7 of the *2005 Building Energy Efficiency Standards Residential Alternative Calculation Methods Approval Manual*.

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The field verification and diagnostic testing procedures described in this Appendix are intended to ensure that the:

- PV modules and inverters used in the expected performance calculations are actually installed in the field;
- PV modules are minimally shaded, or if shaded that the actual shading does not exceed the shading characteristics that were included in the expected performance calculations; and
- Measured output power from the system matches that expected by the PV Calculator within the specified margin at the prevailing conditions at the time of field verification and diagnostic testing.

B. Responsibilities

Field verification and diagnostic testing is the responsibility of both the PV system installer and with the HERS (Home Energy Rating System) rater who completes the third-party field verification. The PV installer must perform the field verification and

diagnostic testing procedures in this document for every system that they install. The HERS rater working under the oversight of an Energy Commission-approved HERS provider then performs independent third-party field verification and diagnostic testing of the systems. For new housing developments, the builder may choose to have the HERS rater complete field verification using the sampling approach described in Section 7.5, including subsections 7.5.1, 7.5.2 and 7.5.3, of the *2005 Building Energy Efficiency Standards Residential Alternative Calculation Methods Approval Manual*.

The field verification and diagnostic testing protocol is the same for both the PV installer and the HERS rater. The protocol anticipates that the PV installer will be able to get on the roof to make measurements, but that the HERS rater will not. The measurements required by this protocol are not required to be completed on the roof, but more accurate measurement techniques are possible with roof access. The measurements required by the protocol may be performed in multiple ways as described in the subsections below.

C. Field Verification and Diagnostic Testing Process

The NSHP field verification and diagnostic testing of solar systems follows the process described below. Note a solar system is one or more strings of PV modules connected to one inverter. Documentation of the process uses three forms that are counterparts to the compliance forms used for the *Building Energy Efficiency Standards*.

1. The user enters the necessary input data into the PV Calculator, which produces an output report (Certificate of Compliance Form (CF-1R-PV)) that documents the specific modules, inverters and meters that are used in each solar system that is installed on the building, the anticipated shading of each system (either the intent for the system to meet the minimal shading requirements or the actual shading that is anticipated), and a table of predicted electric power for each system for a range of solar irradiation and ambient air temperature. The CF-1R-PV and the associated input file is provided to the Energy Commission with the NSHP reservation application and to the HERS Provider.

2. Once each solar system is installed the PV installer completes the field verification and diagnostic testing protocol for each solar system on the building and documents the results on the Installation Certificate (CF-6R-PV), verifying that the installation is consistent with the CF-1R-PV. The PV installer documents and certifies that the PV system meets the requirement of this appendix and provides a copy of the CF-6R-PV to the builder and to the HERS rater.

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3. The HERS rater completes independent third-party field verification and diagnostic testing of each solar system and documents the results on the Certificate of Field Verification and Diagnostic Testing (CF-4R-PV), independently verifying that the installation is consistent with the CF-1R-PV. The HERS rater provides a copy of the CF-4R-PV to the builder and the HERS provider. At the builder's option the HERS rater may complete field verification of

a random sample of solar systems in the housing development in accordance with Section 7.5, including subsections 7.5.1, 7.5.2 and 7.5.3, of the *2005 Building Energy Efficiency Standards Residential Alternative Calculation Methods Approval Manual.* In cases where the CF-6R-PV or the CF-4R-PV shows that the installed solar system is not consistent with the CF-1R-PV that has been previously submitted to the Energy Commission, a revised CF-1R-PV must be prepared and submitted with its associated input file to the Energy Commission and HERS Provider, that is consistent with the as-installed conditions. When such an inconsistency is found when the sampling approach is used, revised CF-1R-PVs must be prepared and submitted to the Energy Commission and the HERS Provider for all systems in the group, consistent with the Energy Commission's re-sampling and corrective action procedures in Chapter 7 of the *2005 Building Energy Efficiency Standards Residential Alternative Calculation Methods Approval Manual.*

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4. The builder (applicant) submits a copy of the Installation Certificate (CF-6R-PV) for each solar system installed on each residential building and the Certificate of Field Verification and Diagnostic Testing (CF-4R-PV) for each solar system on each residential building; for housing developments where the builder has chosen to meet field verification requirements for a sample of residential buildings, the builder submits a CF-4R-PV form for each system for each residential building that is sample tested. The CF-4R-PV form must be generated through the data registry system of a Energy Commission-approved HERS provider. Builders may be required to provide copies of Certificates of Field Verification and Diagnostic Testing to the Energy Commission for other residential buildings in the group upon request. The Rebate Payment Claim Form must be based on system characteristics that produce expected performance calculations that are no better than calculations based on the characteristics reported in the CF-4R-PV. In cases where the CF-4R-PV shows that the installed solar system is not consistent with CF-1R-PV that has been previously submitted to the Energy Commission, a revised CF-1R-PV shall be prepared and submitted that is consistent with the as-installed conditions. When such an inconsistency is found when the sampling approach is used, revised CF-1R-PVs shall be prepared for all systems in the group that was sampled, consistent with the Energy Commission's re-sampling and corrective action procedures.

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In conjunction with the CF-6R-PV, the builder must provide to the installer and rater a site plan that for each lot:

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a) identifies the species of all pre-existing, planted and planned trees and the location and height of any structures which will be built on the lot and neighboring lots of the building with the solar system; and

b) shows the bearing of the property lines and the azimuth and tilt or roof pitch of each PV array.

The builder must also provide the HERS rater a production specification (cut-sheet) for the modules, inverter and meter for the specific system, attached to the

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CF-6R-PV along with an invoice or purchase document, which lists the make and model of PV modules installed in the project.

D. Relationship to Other Codes, Standards and Verification

The local jurisdiction must issue a building permit for the qualifying PV system, either as a separate permit or as part of the new residential building permit, and the PV system must meet all applicable electrical code, structural code and building code requirements. In addition, the local electric utility will have standards regarding interconnection to the electric grid and other matters.

The field verification and diagnostic testing procedures described in this document do not substitute for normal electrical, structural or building plan check or field inspection. Nor do they substitute for field verification by the local utility regarding interconnection to the electric grid.

E. Field Verification Visual Inspection

The purpose of the visual inspection described in this protocol is to verify that the module, inverter and meter specified in the CF-1R-PV for each residential building is properly installed in the field. The HERS rater shall use binoculars or another means to view the installation without being required to get on the roof, and shall verify the models and numbers of modules against the cut sheet/invoices. The HERS rater may rely on photographic evidence provided by the installer on the models and numbers of modules, standoff distance and shading, but in the absence of such evidence, must rely on a conservative determination based solely on their own observation.

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1. PV Modules

The PV installer and the HERS rater must verify that the same number of each make and model number of PV modules used in the expected performance calculations are installed in the field. The PV installer and HERS rater must also verify the module mounting type (flush mounted BIPV or rack mounted) and in the case of rack mounted modules, the standoff distance of the modules above the mounting surface. The PV installer and the HERS rater also must observe and verify the mounting height of the modules (either one story, two story or measured minimum distance above the ground).

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2. Inverters

The PV installer and the HERS rater must verify that the make and model of inverters used in the expected performance calculations are installed in the field.

3. System Performance Meters

The PV installer and the HERS rater must verify that either a separate system performance meter or an inverter with an integral system performance meter is installed that is the same make and model specified on the Reservation Request Form and meets all Guidebook requirements for system performance meters.

4. Tilt and Azimuth

The PV installer and the HERS rater must verify that the tilt and orientation (azimuth) of the PV modules installed in the field match the values that were used to determine the expected performance of each solar system, within ± 5 degrees. In some systems, PV modules may be installed in multiple arrays with different tilts and azimuths. In these cases the tilt and azimuth of each array must be verified. Note that for systems using the California Flexible Installation criteria, the tilt and azimuth of each system must be shown to fall within the range of tilt and azimuth that is allowable under that criteria (see section E. 4. c) below).

a) Determining Tilt

The tilt angle of the PV modules is measured in degrees from the horizontal (e.g. horizontal PV modules will have a tilt of zero and vertically mounted PV modules will have a tilt of 90 degrees). The tilt of the PV modules may be determined in the following ways:

i. Using the building plans

The as-built or construction drawings for the residential building will state the slope of the roof, usually as the ratio of rise to run. If the PV modules are mounted in the plane of the roof then the slope of the PV modules is the same as the slope of the roof. Table 1 may be used to convert rise to run ratios to degrees of tilt.

Table 1 – Conversion of Roof Pitch to Tilt

Roof Pitch (Rise:Run)	Tilt (degrees)
2:12	9.5
3:12	14.0
4:12	18.4
5:12	22.6
6:12	26.6
7:12	30.3
8:12	33.7
9:12	36.9
10:12	39.8
11:12	42.5
12:12	45.0

ii. Using a digital protractor

A digital protractor may be used to measure either horizontal or vertical angles (see Figure 1). These devices when sighted up the slope of the PV modules from the ground will display the slope, relative to the horizontal.

Figure 1 – Digital Protractor

b) Determining Orientation (Azimuth)

The PV installer and the HERS rater must determine the orientation by measuring the azimuth of the PV modules and verify that the azimuth is the same as that used to determine the expected performance of each solar system. The convention that is used for measuring azimuth is to determine the degrees of angle clockwise from north, e.g., north azimuth is zero degrees, east is 90 degrees, south is 180 degrees and west is 270 degrees (see Figure 2).

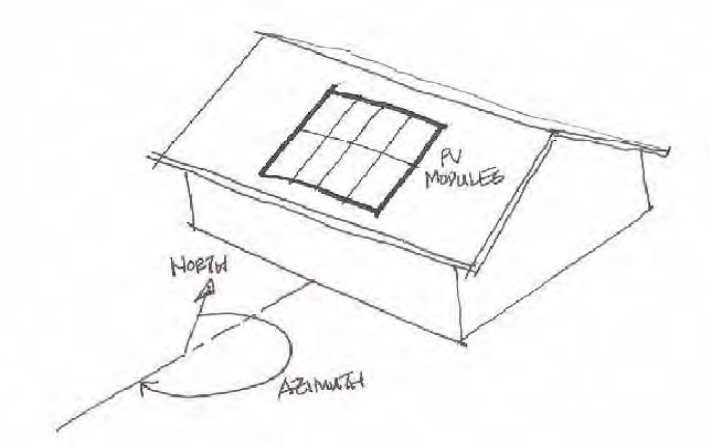

Figure 2 – Azimuth of the PV Array

The following methods may be used to determine the azimuth.

i. Using the plot plans

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In new subdivisions, the house plans will often not show the property lines since the plans are used on multiple lots. However, the subdivision plot plan will show the property lines of the lots. The plot plan will show the bearing of the property lines, and from this information the azimuth of the roof surfaces where the PV modules are mounted may be determined from the position of the house on the lot relative to the bearings of the property lines.

Figure 3 shows an example plot plan with a house located on it. In this case, the house does not align with any of the property lines, but is rotated 15 degrees from the westerly property line as shown. Property lines on plot plans are typically labeled in terms of their bearing, which is the direction of the line. The westerly property line is labeled “North 12° East”. If the house was aligned with this property line, the southerly exposure of the house would have an azimuth of 192 ° (180° plus the 12° bearing of the property line). Since the house is rotated an additional 15°, the azimuth of the southerly face of the house and the azimuth of the PV array is 207° (192° plus 15°). Usually, the house will be aligned with one of the property lines and the calculation described above will be simplified.

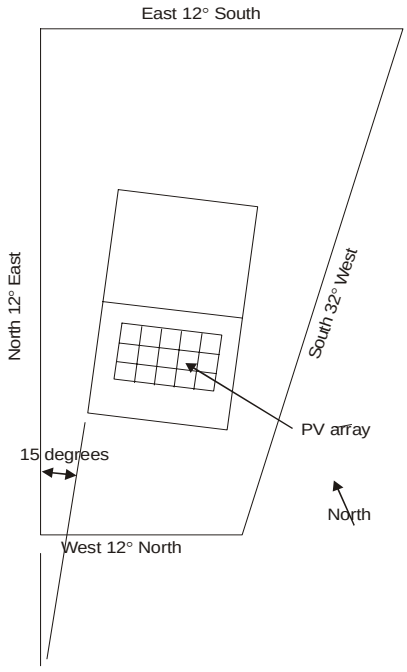

Figure 3 – Example Plot Plan

ii. Using a compass with a sighting feature and an adjustment for magnetic declination.

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Make sure that the compass has a sighting feature. The compass may have an adjustment built in for magnetic declination so that the reading on the compass is true north or the installer and the HERS rater must determine the magnetic declination using the tool available at http://www.ngdc.noaa.gov/seg/geomag/jsp/Declination.jsp and adjust the compass reading to account for the magnetic declination. Position the compass and determine the array azimuth angle between compass north and the direction that the PV modules face. It's usually convenient and most accurate to align the compass along the edge of the array using the sighting feature (see Figure 4).

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Figure 4 –Compass with a sighting feature

c) Verifying Tilt and Azimuth for Systems Meeting the California Flexible Installation Criteria

The NSHP allows determination of expected performance using the California Flexible Installation criteria, which bases the estimated performance on an estimate of the performance for a range of module orientations and tilts. The California Flexible Installation criteria applies to all solar systems that are installed with an azimuth ranging from 150 ^{o} and 270 ^{o} and all modules installed at the same tilt as the roof slope for roof pitches between 4:12 and 7:12. The PV Calculator allows the user to choose the California Flexible Installation criteria for easy input and easy compliance. For each system on each building that has the expected performance based on the California Flexible Installation criteria, the HERS rater must verify that the modules are installed with any azimuth and with any tilt within the acceptable range. Note that to use the California Flexible Installation criteria, each solar system on each site must meet the "minimal shading" criterion discussed below.

F. Shading Verification

The PV installer and the HERS rater must verify that the shading conditions in the field are consistent with those used in the expected performance calculations (CF-1R-PV). The estimated performance calculations will be done either assuming that the "minimal shading" criterion is met or based on the specific shading characteristics of each system and building.

1. Minimal Shading Criterion

The "minimal shading" criterion is that no obstruction is closer than a distance ("D") of twice the height ("H") it extends above the PV modules (see Figure 5 for an artistic

depiction of “H” and “D”). As the figure illustrates the distance “D” must be at least two times greater than the distance “H.” Any obstruction that projects above any portion of the PV array must meet this criterion for the PV array to be considered minimally shaded. Obstructions that are subject to this criterion include:

i. Any vent, chimney, architectural feature, mechanical equipment or other obstruction that projects above the roof of the residential building;
ii. Any part of the neighboring terrain that projects above the roof;
iii. Any tree that is mature at the time of installation of the solar system;
iv. Any tree that is planted or planned to be planted as part of the landscaping for the residential building (the expected performance must be based on the expected mature height of any tree planted or planned to be planted as part of the landscaping for the residential building);
v. Any existing neighboring building;
vi. Any planned neighboring building; if the builder does not know what building or other structure is planned for construction on land that is neighboring the solar system, the shading must be based on the highest and closest dimensions of the building model and setbacks offered by the builder on that land or if the land is not planned for development by the builder, the highest and closest dimensions allowed by zoning.
vii. Any telephone or other utility pole that is closer than thirty feet from the nearest point of the array.

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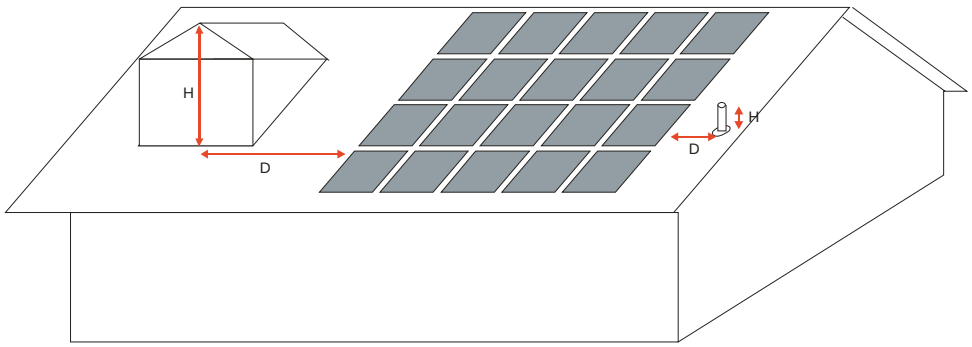

Figure 5 – The Minimal Shading Criterion - Artistic Depiction of “H” and “D”

Neither the PV array nor the shading obstruction are single points in space, so it is the responsibility of the PV installer and the HERS rater to determine the worst condition by determining the point on the array and the point on the obstruction that would result in the smallest ratio of distance from the obstruction point to the array point divided by the height of the obstruction point above the array point. Generally, the portion of the array that will most likely be shaded and thus represents the worst condition is the lower corner of the array that is closest to the obstruction and the portion of the obstruction that is the worst condition is the highest point of the obstruction, but this may not always be the case. Obstructions that are located north of the array at azimuths between 305 degrees and 55 degrees from north relative to the most northerly points on the PV array need not be considered as shading obstructions.

The PV installer and the HERS rater may verify through visual inspection that most obstructions above the roof meet the 2:1 criterion. For obstructions that visual inspection indicates potentially do not meet the criterion, the PV installer and HERS rater must measure the height and distance of the obstruction(s) relative to the PV array as described above to verify that the 2:1 shading criterion is met.

2. Accounting for Actual Shading

When a PV installation does not meet the minimal shading criterion, it can still qualify for an incentive and participate in the NSHP program, but the shading conditions for each solar system at the site must be accounted for in the expected performance calculation as described in this section.

If shading (other than shading that meets the “minimal shading” criterion) is accounted for in the expected performance calculation, then the PV Calculator will produce on the CF-1R-PV a table similar to Table 2 that shows the altitude angle between the PV array and obstructions that shade the PV modules. This table divides the compass into 22.5 degree segments, progressing clockwise around the compass from north. The altitude angle is the angle from the point on the lowest shaded point on the PV array to the highest point on the shading obstruction in each direction segment around the compass. The table also shows the distance-to-height ratio for existing obstructions including mature trees. This will be a number less than or equal to two, because if it is greater than two, the minimal shading criterion is satisfied in that direction and shading is not considered in the expected performance calculation for that segment. The table also shows the minimum distance to small, medium and large trees to meet the minimal shading criterion for trees that are not at their mature heights. The data in Table 2 is specific to a particular PV system installation on the specific residential building. In this example the minimal shading condition is exceeded for four segments of the compass, ESE, SSE, S and WNW.

The PV installer and the HERS rater must verify that the shading conditions that exist (or are expected to exist in the case of the mature heights of trees in the landscaping plan or unbuilt residential buildings or structures on neighboring lots) at the site will not cause greater shading of the modules than the shading characteristics that were used in the expected performance calculations.

Table 2 – Example CF-1R-PV Format for PV Shading

Orientation	Obstruction Type	Altitude Angle to Shading Obstruction	Distance to Height Ratio	Minimum Distance to Small Tree	Minimum Distance to Medium Tree	Minimum Distance to Large Tree
ENE (55 – 79)	NA	Minimal Shading	2.00	16	46	76
E (79 -101)	NA	Minimal Shading	2.00	16	46	76
ESE (101 – 124)	Neighboring structure	45 degrees	1.00			
SE (124 – 146)		Minimal Shading	2.00	16	46	76
SSE (146 – 169)	On roof obstruction	50 degrees	0.84			
S (169 – 191)	Tree (existing-mature)	70 degrees	0.36			
SSW (191 – 214)		Minimal Shading	2.00	16	46	76
SW (214 – 236)	Tree (exisiting-not mature)	30 degrees	1.5			
WSW (236 – 259)		Minimal Shading	2.00	16	46	76
W (259 – 281)		Minimal Shading	2.00	16	46	76
WNW (281 – 305)	Tree (planned)	65 degrees	0.49			

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3. Measuring Heights and Distances or Altitude Angles

One of the following procedures may be used to measure heights and distances or altitude angles to obstructions.

a) Using a Tape Measure

The simplest measurement technique is to use a tape measure or other measuring device to measure the distance from the point on the PV module to the maximum shading condition point on shading obstructions in each 22.5 degree compass segment. The distance to a tree that has not reached its mature height is measured to the nearest edge of the trunk of the tree. Once the elevation difference (H) and distance (D) are determined in each compass segment, the ratio is calculated and must be greater than the value used in the expected performance calculation as reported on the CF-1R-PV (see the third column in Table 2 labeled Distance to Height Ratio). This method does not require getting on the roof.

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b) Using a Digital Protractor

A digital protractor (see Figure 1) may be used to measure the altitude angle. The measured altitude angle must be smaller than or equal to that used in the expected performance calculation as reported on the CF-1R-PV (see the second column of Table 2). To use the digital protractor measurement directly, the measurement must be made from the roof. Alternatively, the digital protractor measurement may be made from the ground and trigonometric adjustments will be required to adjust for the height difference between the ground where the measurements are made and the point of maximum shading of the PV modules in that compass segment.

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c) Using a Solar Access and Shading Analysis Instrument

For shading from existing obstructions, such as neighboring buildings or other structures, terrain or already mature trees, on-site shading conditions can be verified using an instrument such as the Solar Pathfinder (see Figure 6). This instrument must be positioned at the point on the PV array that has the maximum shading. Generally, this will be one of the two lower corners of the array, but depending on the conditions of the site, other locations may be subject to more shading by adjacent buildings or structures, trees, terrain or other obstructions. This procedure will typically be used by the PV installer, but not by the HERS rater since the HERS rater is not expected to be able to get on the roof.

Once the instrument is placed at the point on the PV array that has the maximum shading, it is leveled and oriented with true north. The orientation may be determined by using the site plan or a compass as described above. Once the instrument is properly positioned, objects that will cast a shadow on the PV modules will be shown for the month and time of day when shading will occur (see Figure 7). These results are then converted into the format used by the PV Calculator, shown in Figure 7(b) by using an Angle Estimator grid overlay (shown in Figure 6) to determine the altitude angle of an obstruction in each compass segment. The installer shall attach the diagram shown in Figure 7(b) to the CF-6R-PV form, along with photographic evidence of the shading shown on the instrument, the location of the instrument on the array, and the shading obstructions that are indicated on the instrument, for the HERS rater to verify the results shown on the diagram. The results determined by the instrument are compared to the data that was used in the expected performance calculations to ensure that there is not greater shading at the site than was used in the expected performance calculations.

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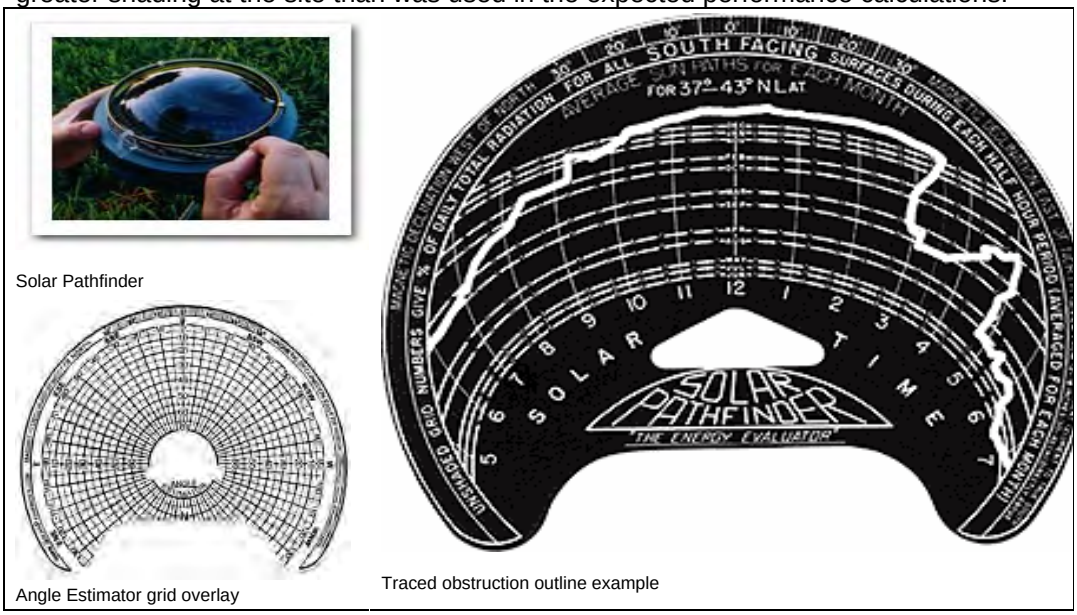
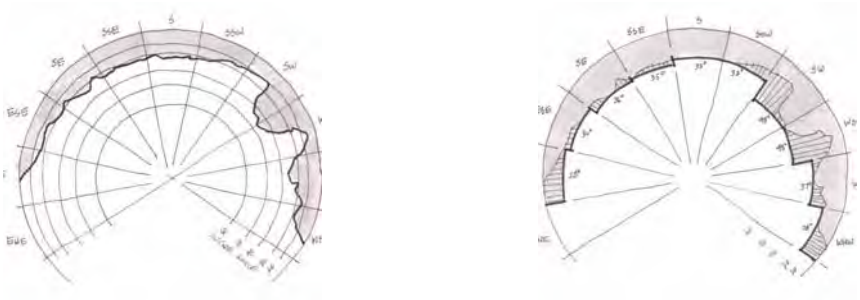


Figure 6 – Example Solar Access and Shading Analysis Instrument



(a) This diagram shows the 22.5 ° compass segments used by the PV Calculator and the altitude angles.

(b) Within each compass segment, the highest altitude is selected and used for that entire segment. This data is input into the PV Calculator.

Figure 7 – Conversion of Results from Solar Pathfinder to PV Calculator Input

Note that this method does not address expected shading resulting from the mature heights of planted or planned trees in the landscaping plan or expected construction of buildings or other structures on neighboring lots. Determining distances for planted trees should use a tape measure. Determining distances for planned trees should use the landscape plan provided by the builder. The height measurement for trees that are not yet mature must be based on the Mature Tree Height discussed below. Determining the distances and heights of obstructions for buildings and structures that have not yet been constructed on neighboring lots must be based on plans for those structures assuming that they will be located at the closest setbacks to the residential building that is being field-verified or the highest and closest dimensions allowed by zoning for future buildings on neighboring land.

d) Using a Digital Camera with Fisheye Lens

An electronic enhancement of the Solar Pathfinder uses a digital camera with a fisheye lens that is mounted looking up. An image is taken that is automatically processed to produce data similar to the solar pathfinder. The data must be converted to the format used for determining expected performance as described above for the Solar Pathfinder. Note that determining distances and heights for trees that are not yet at mature heights and unconstructed buildings and structures on neighboring lots must be addressed as described above for the Solar Pathfinder. The installer shall attach the diagram shown in Figure 7(b) to the CF-6R-PV form, along with photographic evidence of the shading shown on the instrument, the location of the instrument on the array, and the shading obstructions that are indicted on the instrument, for the HERS rater to verify the results shown on the diagram. Note that this method does not address expected shading resulting from the mature heights of planted or planned trees in the landscaping plan or expected construction of buildings or other structures on neighboring lots. Such shading must be addressed separately.

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4. Mature Tree Height

The expected performance calculations require the mature height to be used when accounting for the shading impact of planted and planned trees in the landscaping plan that have not yet reached their mature heights. This section provides guidelines for determining the mature height of such trees. Builders must identify the species of all planted and planned trees in the landscaping plans. That information must be documented in conjunction with the CF-6R-PV and provided to the HERS rater for verification.

All trees are classified as small, medium or large by species. Trees with a mature height of 20 feet or smaller are small trees. Trees with a mature height greater than 20 feet but less than 50 feet are medium trees. Trees with a mature height greater to or equal to 50 feet are large trees. If the type of tree is unknown, it must be assumed to be large. The mature heights of small, medium and large trees that must be used in the expected performance calculations are 20 feet, 35 feet, and 50 feet, respectively.

The Center for Urban Forestry Research of the U.S. Department of Agriculture's Forest Service has published tree guides for tree zones that are applicable to California. Table 3 shows the appropriate tree guide to use for each of California's climate zones for the expected performance calculations.

The guides provide tree selection lists for each tree zone. The lists provide either the mature height or the size category in that tree zone for each species. These tree guides are posted: www.fs.fed.us/psw/programs/cufr/tree_guides.php.

For trees not listed in the tree selection tables of the tree guides, the Sunset Western Garden book should be consulted. This document provides the mature height range or maximum height for each species. If a range is given, the average of the maximum height range should be used to determine if the tree is large, medium or small.

Table 3 – Appropriate Tree Guide to Use for each California Climate Zone

CEC Climate Zones	Tree Regions	Tree Guide to Use	
1, 2, 3, 4, 5	Northern California Coast	Under Development (Use Sunset Western Garden Book)	
6, 7, 8	Southern California Coast	McPherson, E.G., et al. 2000. Tree guidelines for coastal Southern California communities. Sacramento, CA: Local Government Commission	Chapter 5, pages 57-65
9, 10	Inland Empire	McPherson, E.G., et al. 2001. Tree guidelines for Inland Empire communities. Sacramento, CA: Local Government Commission	Chapter 6, pages 65-82
11, 12, 13	Inland Valleys	McPherson, E.G., et al. 1999. Tree guidelines for San Joaquin Valley communities. Sacramento, CA: Local Government Commission	Chapter 5, pages 50-55
14, 15	Southwest Desert	McPherson, E.G., et al. 2004. Desert southwest community tree guide: benefits, costs and strategic planting. Phoenix, AZ: Arizona Community Tree Council, Inc.	Chapter 7, pages 51-53
16	Northern Mountain and Prairie	McPherson, E.G, et al. 2003. Northern mountain and prairie community tree guide: benefits, costs and strategic planting. Center for Urban Forest Research, USDA Forest Service, Pacific Southwest Research Station.	Chapter 5, pages 47-55

Table 4 shows the horizontal distance that trees of each mature height category would need to be located from nearest point of the PV modules in order to meet the condition of minimal shading.

Table 4 – Horizontal Distance Trees Would Need to be located from the Closest Point of a PV Array to Qualify for Minimal Shading

Mounting Location	Small Tree (20 ft)	Medium Tree (35 ft)	Large Tree (50 ft)
1 Story (Lowest Point of Array at 12 ft)	16	46	76
2 Story (Lowest Point of Array at 22 ft)	Any Distance	26	56
3 Story (Lowest Point of Array at 32 ft)	Any Distance	6	36

G. Verification of System Performance

The PV installer and HERS rater must verify that the AC output power from the PV system is consistent with that predicted by the PV Calculator. The PV Calculator will determine an estimate of system AC output power for a range of solar irradiance and outdoor air temperature conditions, and print a table on the CF-1R-PV form. The values in the table will be 90 percent of the output estimated by the PV Calculator for each set of conditions in the table (the calculations also include the default adjustment of 0.88 for losses such as dirt, dust and mismatched wiring). An example of the data that will be produced is shown in Table 5. Note that the data calculated by the PV Calculator is specific to each PV system.

Verification of system performance must be performed after the PV system is installed and connected to the electricity grid. Measurements must be made with a minimum irradiance of 300 W/m² in a plane parallel to the array. The PV installer and/or the

HERS rater must 1) measure the solar irradiance in a plane parallel to the array 2) measure the ambient air temperature and 3) determine the expected output power for the measured field conditions from the table on the CF-1R-PV form. The PV installer or the HERS rater must then observe the output AC power displayed on the inverter and verify that the output AC power is at least the amount shown in the table for the field measured conditions. To qualify for the NSHP, PV systems must have an inverter that has a built in meter that measures output AC power.

The PV installer and HERS rater must observe the output AC power on the inverter after waiting for a five minute time period during which the measured solar irradiation level has stayed constant within ± 5 percent. If the solar irradiation level changes outside of these ranges during the five minute waiting period, the PV installer and HERS rater must start over the five minute waiting period.

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Table 5 – Example Table of Expected Output AC Power from PV Calculator (Watts)

(W/m²)	T=15	T=20	T=25	T=30	T=35	T=40	T=45	T=50	T=55	T=60	T=65	T=70	T=75	T=80	T=85	T=90	T=95	T=100	T=105	T=110	T=115	T=1
300	614	606	599	591	584	576	568	560	553	544	536	528	520	512	504	496	487	479	471	463	454	446
325	665	657	648	640	632	623	615	607	598	590	581	572	564	555	546	537	528	519	510	501	492	483
350	716	707	698	689	680	671	662	653	643	634	625	616	606	597	588	578	569	559	550	540	530	520
375	766	757	747	738	728	718	708	699	689	679	669	659	649	639	629	619	609	598	588	578	568	557
400	817	807	797	786	776	765	755	745	734	723	713	702	691	681	670	659	648	637	626	615	604	593
425	868	857	846	835	824	813	802	790	779	768	757	745	734	722	711	699	688	676	664	653	641	629
450	918	907	895	883	872	860	848	836	824	812	800	788	776	764	752	739	727	715	702	690	677	665
475	967	955	943	931	919	907	894	882	869	856	843	831	818	805	792	779	766	753	740	727	714	700
500	1016	1004	991	978	966	953	940	927	913	900	887	873	860	846	832	819	805	791	777	763	750	736
525	1065	1052	1038	1025	1012	998	984	971	957	943	929	915	901	887	872	858	843	829	814	800	785	770
550	1113	1099	1085	1071	1057	1043	1029	1014	1000	986	971	956	942	927	912	897	882	866	851	836	820	805
575	1161	1147	1132	1117	1102	1088	1073	1058	1043	1027	1012	997	982	966	951	935	919	903	887	871	855	839
600	1209	1194	1178	1163	1147	1132	1116	1100	1085	1069	1053	1037	1021	1005	989	972	956	940	923	906	890	873
625	1256	1240	1224	1208	1192	1176	1159	1143	1126	1110	1093	1077	1060	1043	1026	1009	992	975	958	941	924	906
650	1302	1286	1269	1252	1236	1219	1202	1185	1168	1150	1133	1116	1098	1081	1063	1046	1028	1010	992	974	957	939
675	1348	1331	1314	1296	1279	1261	1244	1226	1208	1190	1172	1154	1136	1118	1100	1081	1063	1045	1026	1007	989	970
700	1394	1376	1358	1340	1322	1304	1285	1267	1248	1230	1211	1192	1174	1155	1136	1117	1098	1078	1059	1040	1021	1001
725	1439	1420	1401	1383	1364	1345	1326	1307	1288	1269	1249	1230	1210	1191	1171	1151	1132	1112	1092	1072	1052	1032
750	1483	1464	1444	1425	1405	1386	1366	1346	1327	1307	1287	1267	1246	1226	1206	1185	1165	1144	1124	1103	1082	1061
775	1526	1506	1487	1466	1446	1426	1406	1385	1365	1344	1323	1303	1282	1261	1240	1219	1198	1176	1155	1134	1112	1090
800	1569	1549	1528	1507	1486	1466	1445	1423	1402	1381	1360	1338	1317	1295	1273	1252	1230	1208	1186	1164	1141	1119
825	1611	1590	1569	1547	1526	1504	1483	1461	1439	1417	1395	1373	1351	1328	1306	1284	1261	1238	1216	1193	1170	1147
850	1653	1631	1609	1587	1565	1542	1520	1498	1475	1452	1430	1407	1384	1361	1338	1315	1292	1268	1245	1221	1198	1174
875	1693	1671	1648	1626	1603	1580	1557	1534	1510	1487	1464	1440	1417	1393	1369	1345	1322	1298	1273	1249	1225	1200
900	1733	1710	1687	1663	1640	1616	1593	1569	1545	1521	1497	1473	1449	1424	1400	1375	1351	1326	1301	1276	1251	1226
925	1772	1748	1725	1701	1676	1652	1628	1603	1579	1554	1529	1505	1480	1455	1430	1404	1379	1354	1328	1302	1277	1251
950	1811	1786	1762	1737	1712	1687	1662	1637	1612	1586	1561	1536	1510	1484	1459	1433	1407	1381	1354	1328	1302	1275
975	1980	1823	1798	1772	1747	1721	1696	1670	1644	1618	1592	1566	1540	1513	1487	1460	1434	1407	1380	1353	1326	1299
1000	1980	1980	1980	1807	1781	1755	1729	1702	1676	1649	1622	1595	1569	1542	1514	1487	1460	1432	1405	1377	1349	1322
1025	1980	1980	1980	1980	1815	1788	1761	1734	1706	1679	1652	1624	1597	1569	1541	1513	1486	1457	1429	1401	1372	1344
1050	1980	1980	1980	1980	1980	1820	1792	1765	1737	1709	1681	1653	1624	1596	1568	1539	1511	1482	1453	1424	1395	1365
1075	1980	1980	1980	1980	1980	1980	1823	1795	1767	1738	1709	1680	1652	1623	1593	1564	1535	1506	1476	1446	1417	1387
1100	1980	1980	1980	1980	1980	1980	1980	1825	1796	1766	1737	1708	1678	1648	1619	1589	1559	1529	1499	1468	1438	1407
1125	1980	1980	1980	1980	1980	1980	1980	1980	1824	1794	1764	1734	1704	1674	1643	1613	1582	1551	1520	1490	1458	1427
1150	1980	1980	1980	1980	1980	1980	1980	1980	1980	1822	1791	1760	1729	1698	1667	1636	1605	1573	1542	1510	1479	1447
1175	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1817	1786	1754	1722	1691	1659	1627	1595	1563	1530	1498	1466
1200	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1810	1778	1746	1714	1681	1649	1616	1583	1550	1517	1484

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1. Measuring Solar Irradiance

Solar irradiance must be measured by using a solar pyranometer. When making this measurement, the PV installer or HERS rater must place the pyranometer in a plane that is parallel to the PV modules. The PV installer should position the pyranometer on top of the PV modules or on the roof next to the PV modules. The HERS rater who is not likely to be able to get on the roof must position the pyranometer 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 properly position the pyranometer.

2. Measuring Ambient Air Temperature

Ambient air temperature must be measured with a digital thermometer in the shade. The instrument must have an accuracy of ± 2 ^{o} C.

3. Observing Output AC Power at the Inverter

The PV installer and the HERS rater must observe and record the reading within five minutes of the time the measurements of solar irradiation and ambient temperature were made. Note that the inverter may cycle between multiple readings (total kWh of production, output power, etc.), so the PV installer or HERS rater 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.

4. Multiple Orientation Arrays

For larger systems, PV modules connected to the same inverter may be installed with strings of equal numbers of modules connected in parallel in more than one orientation, each with its own tilt and azimuth (note that it is bad practice to install such strings in series or with a different number of modules in each string; either of these installations will lead to substantial reductions in performance). When strings are installed in multiple orientation arrays to the same inverter, separate CF-1R-PV forms must be prepared for each orientation, and solar irradiance must be measured separately in a plane parallel to each string that has a different azimuth and tilt. The expected output AC power is determined separately for each condition and the sum is used for verification purposes.

For example a qualifying 3 kW PV system has 42 PV modules grouped in two parallel strings, one south (azimuth of 170 degrees) and one west (azimuth of 260 degrees). The south facing array has 21 PV modules and the west facing array has 21 PV modules connected in parallel to maintain system voltage. The HERS rater verified system performance at 11:30 AM in March and measured a solar irradiance of 950 W/m² in a plane parallel to the south array and 500 W/m² in a plane parallel to the west facing array. The ambient temperature at the time of the testing is 62 ^{o} F.

The expected AC output power table on the CF-1R-PV indicates that the system should be producing 1,200 W at 950 W/m² and 700 W at 500 W/m² of solar irradiance. The expected output AC power to be compared to the inverter display is calculated to be 1,900 W based on the following equation.

Expected AC Output Power (W) = 1,200 + 700

= 1,900 W

Note that to test systems with multiple arrays the solar irradiance levels on all of the arrays must stay constant for the five minute waiting period discussed in Section G above

Appendix 5 - Reservation and Payment Checklists

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The following is a basic checklist of the information required for a reservation; and for an incentive payment. The prospective applicant must read the entire Guidebook to be thoroughly informed of the program requirements prior to applying to the program.

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i. Reservation Checklist for projects where solar will be a standard feature and for Affordable Housing (Eligible for 36-month Reservation)

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The following information must be provided initially to apply for a reservation for incentives from the NSHP:

1. A completed Reservation Application Form (NSHP-1)
2. Expected Performance-Based Incentive (EPBI) calculations (PV calculator output CF-1R-PV form and its associated input file)
3. Tentative or final subdivision map
4. Cost Estimate from Energy Commission registered solar retailer to purchase and install system(s)
5. Construction Plan Set (Architectural floor plan, elevation, section, electrical and mechanical plan, and site plan with orientation)
6. Energy Efficiency Documentation completed by a Certified Energy Plans Examiner (CEPE): the CF-1R form, and its associated input file (e.g. *.bld or *.mp7) in digital format; this documentation must be consistent with the Construction Plan Set.
7. System Size Justification and Eligible Utility Evidence (only if PV system is above 5 kW). For more details, see page 42.

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Applicants are strongly encouraged to participate in their utility's new construction program to obtain the financial incentives that they earn for meeting either Tier I or Tier II, and to streamline the process for demonstrating that the energy efficiency requirements are met. Construction Plan Sets and Energy Efficiency Documentation submitted and approved by utility new construction programs will not have to be also submitted to the Energy Commission.

Applicants must submit the CF-1R form and the associated input file (e.g. *.bld or *.mp7) in digital format for uploading into the data registry of one of the Energy Commission-approved HERS Providers. This step normally will be completed in conjunction with the utility new construction processes. Applicants who do not participate in utility new construction programs must demonstrate separately to the Energy Commission that this submission to the HERS Provider has occurred, and all measures required to achieve the Tier I or Tier II energy efficiency level have been entered into the Provider's registry for field verification.

Applicants must submit each CF-1R-PV form and the associated input file in digital format for review by the program administrator and uploading into the data registry of one of the Energy Commission-approved HERS Providers.

By the sixth month of the reservation, builders must provide the following information:

1. 6 month Reservation Approval and Update form (NSHP-1.6)
2. Equipment Purchase Agreement and Installation Contract
3. Build-out schedule
4. Payee Data Record (STD-204)

By the 24th month of the reservation, builders must provide the final subdivision map.

ii. Reservation Checklist for All Other Categories of Housing that are applying for the base incentive (Eligible for 18-month Reservation)

The same information is required for all other categories of housing with the following exceptions:

- A building permit for individual buildings may be provided instead of a subdivision map
- Invoices or receipts may be provided for at least 10 percent of the system equipment price instead of an equipment purchase agreement
- There is no 6 month reservation approval process

iii. Payment Checklist

To receive an incentive payment, the applicable reservation requirements must have been satisfied. Incentive payment(s) will be made as systems are installed. The following information must be provided to the Energy Commission or Energy Commission-designated NSHP administrator:

1. Payment Claim Form (NSHP-2)
2. Ten-Year Warranty Form (NSHP-3)
3. Final Building Permit and Final Inspection Signoff
4. Proof of Interconnection with Utility
5. Energy Efficiency Documentation (CF-4Rs generated through HERS Provider registry for all measures needed to meet Tier I or II consistent with the CF-1R input files; participants in utility new construction programs are not required to separately submit this information)
6. Expected Performance Based Incentive (EPBI) Documentation (CF-4R-PVs generated through HERS Provider registry consistent with CF-1R-PV input files (CF-1R-PV input files revised if necessary to match as-installed conditions)

Appendix 6 - NSHP Forms

NSHP-1 Reservation Application Form NSHP-1.6 General Approval/6-Month Reservation Update Form

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NSHP-2 **Rebate Claim Form/Initial Approval for Solar as Option**

NSHP-3 **Ten-Year Warranty Form**

NSHP-4 **Equipment Seller Information Form**

STD-204 **Payee Data Record**

NSHP-1

RESERVATION APPLICATION FORM
NEW SOLAR HOMES PARTNERSHIP

1. Applicant Name and Contact Information

Name

Please check one of the following:

I am the: Homeowner Builder/Developer Retailer/Installer Other

Mailing Address City: State: Zip Code:

Contact Name (if different from above) & Title	Phone Number	Fax Number	Email Address

2. Project Description

Please give a general project description including the site address of development: Please provide site-specific information on the project:

Name of development (if available):

Address to where the system will be installed (if this is a housing development, only the city or location to nearest city needs to be specified):

Please check all that apply to your project:

Yes No Is this an affordable housing project? Please note, affordable housing projects must abide by the provisions stated on pgs. 24-26 of the *NSHP Guidebook*.

Housing type: Single Family Multifamily/Mixed-Use

Yes No Custom home?

If this is a housing development, please check all that apply to your project.

Yes No Housing development with 6 or more dwelling units?

Yes No If yes, will solar be installed on 50% or more of the residential buildings?

Yes No Development with less than 6 dwelling units?

Yes No Is solar offered as an option? Please note, if solar is offered as an option, your reservation can only be for up to 10% of the residential buildings in the development.

Total number of residential buildings in development:

Total number of residential buildings with solar system installations:

If this is a multifamily or mixed-use project, please select the type(s) of system installation and provide the number of the system installations. Please note that no incentive from the NSHP will be provided for any PV system covering any portion of the building that is nonresidential (i.e., commercial space):

Common areas – Quantity: Residential units – Quantity:

Please note that only housing developments with 6 or more units installing solar on 50% or more of residential buildings will receive a 36-month reservation. Multifamily affordable housing projects are also eligible to receive a 36-month reservation. All others will receive an 18-month reservation.

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Deleted: Please check below what type of housing development this reservation is for:¶
Housing Development with 6 or more units installing solar on 50% or more of residential buildings¶
Housing Development with 6 or more units installing solar on less than 50% of the residential buildings¶
Small Developments (under 6 residential dwelling units)¶
Custom Home(s)¶
Development where solar is an option** ¶
Affordable Housing¶
¶
Please note that only housing developments with 6 or more units installing solar on 50% or more of residential buildings will receive a 36-month reservation. Affordable housing will also be eligible to receive a 36-month reservation. All others will receive an 18-month reservation. ¶
**If solar is an option, your reservation can only be for up to 10% of the residential buildings in the development.

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3. Equipment Purchase (complete if this a housing development with 6 or more units installing solar on 50% or more of residential buildings or a multifamily affordable housing project)

Have you committed to purchase or have purchased PV equipment? Yes No

Yes (Please fill out the all the sections below.)

No (Please skip Section 3 and complete all others.)

Quantity	Manufacturer, Model (Equipment must comply with Energy Commission Lists of Eligible Equipment)	Generating Equipment

Quantity	Manufacturer, Model (Equipment must comply with Energy Commission Lists of Eligible Equipment)	Inverters

4. Estimated PV Performance and Cost

Please provide the Seller's Name and Address below. Seller must be registered with the Energy Commission. If the seller is not registered, seller must submit a completed NSHP-4 to the Energy Commission.

Average expected performance per residential building (CEC-PV Calculator output):

Estimated solar system cost (equipment & installation) per residential building:

Estimated solar system cost (equipment & installation) for development:

4. Electric Utility Participation in Utility's Energy Efficiency Program

Please select the utility providing electricity to the project: PG&E SCE SDG&E BVE

Is your project participating in the electric utility's residential new construction program? Yes No

*Please note that projects participating in the electric utility's energy efficiency program can waive the submission of the energy efficiency documentation; contact the Energy Commission if you need more information in this regard.

5. Home Energy Rating System (HERS) information

	HERS Rater Company	HERS Rater	Rater Phone number	Name of HERS Provider
Energy efficiency measures verification				
PV installation field verification				

6. Declaration

The undersigned party declares under penalty of perjury that the information in this form and the supporting documentation submitted herewith is true and correct to the best of his or her knowledge and acknowledges the following program requirements to reserve funding:

Incentives are based on the expected performance of the systems installed.
Builders must achieve at the minimum Tier I Energy Efficiency to be eligible for the program.
Site of PV system installation cannot be changed once a reservation has been approved.

The undersigned party further acknowledges that he or she is aware of the requirements and conditions of receiving funding under the New Solar Homes Partnership (NSHP) and agrees to comply with all such requirements and conditions as provided in the Energy Commission's NSHP Guidebook and Overall Program Guidebook as a condition to receiving funding under the NSHP. The undersigned party authorizes the Energy Commission, during the term of the NSHP, to exchange information on this form with applicable electric utility servicing the project to verify compliance with NSHP requirements.

Signature of Applicant or Applicant's Representative and Rebate Recipient Information

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Name: _____

Title: _____ Date: _____

Signature: _____

The NSHP Rebate will be paid to: _____

Recipient's Address: _____

_____

_____

Required Supporting Documentation

For housing developments with 6 or more units installing solar on 50% or more of residential buildings or multifamily affordable housing projects who have not purchased or committed to purchase PV:

- Tentative or Final Subdivision Map
- Solar Equipment Estimate
- EPBI Calculations
  - ☐ CF-1R-PV form
  - ☐ Electronic input file (*.emf)
- Energy Efficiency Documentation *(waived if participating in utility residential new construction program)*
  - ☐ CF-1R form generated by a CEPE
  - ☐ Electronic input file used to generate the T24 compliance documentation
- Construction plan set: *(waived if participating in utility residential new construction program)* a) architectural floor plans, elevations and sections (should include information on windows and other measures used for the Title 24 energy calculations); b)site plan for custom homes indicating the north direction; c) electrical plans (as appropriate for Title 24 plan check) d) Mechanical plans (should include information relevant for Title 24 plan check)

For housing developments with 6 or more units installing solar on 50% or more of residential buildings or multifamily affordable housing projects who have purchased or committed to purchase PV:

- Equipment Purchase Agreement
- Labor Contract (if separate from construction contract)
- Final Subdivision Map
- Build-Out Schedule
- Energy Efficiency Documentation *(waived if participating in the utility residential new construction program)*
  - ☐ CF-1R form generated by a CEPE
  - ☐ Electronic input file used to generate the T24 compliance documentation
- Construction plan set: *(waived if participating in utility residential new construction program)* a) architectural floor plans, elevations and sections (should include information on windows and other measures used for the Title 24 energy calculations); b)site plan for custom homes indicating the north direction; c) electrical plans (as appropriate for Title 24 plan check) d) Mechanical plans (should include information relevant for Title 24 plan check)
- EPBI Calculations
  - ☐ CF-1R-PV form
  - ☐ Electronic input file (*.emf)
- System Size Justification where applicable, or if greater than 5kW/unit
- Payee Data Record (STD-204), if payee has never received payments from the NSHP before

For all other housing categories:

- Equipment Purchase Agreement
- Labor Contract (if separate from construction contract)
- Building Permit or Final Subdivision Map
- Build-Out Schedule
- Energy Efficiency Documentation *(waived if participating in utility residential new construction program)*
  - ☐ CF-1R form generated by a CEPE
  - ☐ Electronic input file used to generate the T24 compliance documentation
- Construction plan set: *(waived if participating in utility residential new construction program)* a) architectural floor plans, elevations and sections (should include information on windows and other measures used for the Title 24 energy calculations); b)site plan for custom homes indicating the north direction; c) electrical plans (as appropriate for Title 24 plan check) d) Mechanical plans (should include information relevant for Title 24 plan check)
- EPBI Calculations
  - ☐ CF-1R-PV
  - ☐ Electronic input file (*.emf)
- System Size Justification where applicable, or if greater than 5kW/unit
- Payee Data Record (STD-204), if payee has never received payments from the NSHP before

Mail the completed reservation application to:
California Energy Commission
NSHP, Reservation Application
1516 Ninth Street, MS-45
Sacramento, CA 95814-5512

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Deleted: Supporting Documents to Attach if Builders Have Not Purchased or Committed to Purchase PV:¶ <#>Subdivision Map¶ <#>Solar Equipment Estimate¶ <#>EPBI Calculations for each system¶ <#>Energy Efficiency Documentation¶ <#>Construction Plan-Set¶
Deleted: Supporting Documents to Attach if Builders Have Already Purchased or Committed to Purchase PV:¶ <#>Equipment Purchase Agreement¶ <#>Labor Contract (If separate from ¶ construction contract)¶ <#>Final Subdivision Map¶ <#>Construction Plan-Set¶ ... [40]
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NSHP-1.6

GENERAL APPROVAL/ 6-MONTH RESERVATION UPDATE FORM

(For 36-month reservation applicants who had not previously committed to PV equipment purchase)

NEW SOLAR HOMES PARTNERSHIP

This is to confirm that your application to reserve financial incentives through the NSHP has been approved. The amount of funding reserved for your project is _____. This approval is based on the information you provided in your application NSHP-1, dated _____, and any subsequent information you provided. Your reservation period begins _____.

Please complete all the sections below and attach all required supporting documentation to this form within 6 months starting on the date stated above as some changes may affect the amount of financial incentives you will ultimately be entitled to.

Once this form and all supporting documentation have been submitted and reviewed, the program will issue you a NSHP-2 Rebate Payment Claim Form incorporating all changes from this form.

1. Applicant Name and Contact Information

Name			
Mailing Address	City	State	Zip Code
Contact Name (if different from above) & Title	Phone Number	Fax Number	Email Address

2. Project Description

Please list any modifications since the initial reservation submittal (Attach additional pages if necessary)

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Deleted: Site Address:
City: State:
Zip Code: ... [41]

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Deleted: Generating Equipment

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Yes (If yes, how many systems now meet the Criteria? _____) No

Deleted: Has the number of Systems with Orientations, Tilts or Shading that does not meet the California Flexible Installation Criteria changed?¶
Yes (If yes, how many systems now meet the Criteria? _____) No

Deleted: Has the total number of Residential Buildings in the development changed?¶
Yes (If yes, how many homes are now in the development? _____) ¶
No

Deleted: Has the total number of Residential Buildings with system installations changed?¶
Yes (If yes, how many residential buildings now have system installations? _____) No

Deleted: Is the development on schedule in being completed? ¶
Yes No (If no, when will it approximately be completed? ___/___)

Deleted: Has the number of Systems on Residential Buildings meeting the Tier I Energy Efficiency Criteria changed?¶
Yes (If yes, how many systems now meet the Criteria? _____) No

Deleted: Has the number of Systems on Residential Buildings meeting the Tier II Energy Efficiency Criteria changed?¶
Yes (If yes, how many systems now meet the Criteria? _____) No

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Deleted: Quantity

Deleted: Manufacturer, Model¶ (Equipment must comply with Energy Commission¶ Lists of Eligible Equipment)

Deleted: Inverters

Deleted: Final Equipment Seller Name and Address:

Deleted: Final System Installer Name and Address:

4. Estimated PV Performance and Cost

Estimated solar system cost (equipment & installation) per residential building:

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Estimated solar system cost (equipment & installation) for development:

5. Declaration

The undersigned parties declare under penalty of perjury that the information in this form and the supporting documentation submitted herewith is true and correct to the best of their knowledge and acknowledges the following program requirements to reserve funding:

Incentives are based on the expected performance of the systems installed.
Builders must achieve at the minimum Tier I Energy Efficiency to be eligible for the program.
Site of PV installation has not changed since the reservation had been approved.

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The undersigned party further acknowledges that he or she is aware of the requirements and conditions of receiving funding under the New Solar Homes Partnership (NSHP) and agree to comply with all such requirements and conditions as provided in the Energy Commission's NSHP Guidebook and Overall Program Guidebook as a condition to receiving funding under the NSHP. The undersigned parties authorize the Energy Commission during the term of the NSHP to exchange information on this form with the electric utility servicing the project to verify compliance with NSHP requirements.

Signature of Applicant or Applicant's Representative

Name: _____

Title: _____ Date: _____

Signature: _____

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Mail complete the reservation update package to:
California Energy Commission
NSHP, Reservation Update
1516 Ninth Street, MS-45
Sacramento, CA 95814-5512

Supporting Documents to Attach:
- Equipment Purchase Agreement
- Labor Contract (If separate from construction contract)
- Build-Out Schedule
- Construction Plan-Set
- Payee Data Record (STD-204), if payee has never received payments from the NSHP before
- Any additional supporting documentation that has changed since the initial reservation submittal

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Equipment Purchase Agreement¶
Labor Contract (If separate from construction contract)¶
Build-Out Schedule¶
EPBI Calculations (if revised since original application)¶
Payee Data Form

NSHP Contact: _____

Phone: _____

E-mail: _____

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NSHP-2

_REBATE PAYMENT CLAIM FORM
_INITIAL APPROVAL FOR SOLAR AS OPTION
NEW SOLAR HOMES PARTNERSHIP

[CEC use only]

EPBI watts: _____ Rebate @ _____ = $_____

Reservation Approval Date:_____

Reservation # _____

Project Name _____

Address or _____

Lot Number _____

1. Confirmation of Reservation Amount (for Solar Installed on a Specified Number of Homes)

_____ has been granted a reservation of $ _____ for a _____ kW solar system. The reservation will expire on _____. The system is being installed at _____ and is expected to produce _____ (kWh per year). The payment will be made to the _____.

The solar system must be completed and the claim submitted with the appropriate documentation by the deadline. Claims must be postmarked by the expiration date or the reservation will expire. This reservation is non-transferable. System must be installed at the installation address and sold to the above.

1. Confirmation of Reservation Amount (for Solar Installed as Options)

This is to confirm that your application to reserve financial incentives through the NSHP has been approved. The amount of funding reserved for your project is _____. This approval is based on the information you provided in your application NSHP-1, dated _____, and any subsequent information you provided.

Please complete Sections 2 and 3 only, sign below, and attach all required supporting documentation to this Form for each residential building with solar installed within 18 months, starting on the date stated above. Some changes may affect the amount of financial incentives you will ultimately be entitled to.

Once this form and all supporting documentation have been submitted and reviewed, the program will issue you a new NSHP-2 Rebate Payment Claim Form with residential building-specific information incorporated.

2. Major System Equipment of Record (Modules, Inverters, Meters)

Quantity	Manufacturer	Model	Cost
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

3. System Details

Total System Price: _____
EPBI yearly output: _____
HERS rater output: _____
HERS rater name: _____
HERS rater number: _____

Lot Number: _____
Final Address: _____
Building Permit Signoff Date: _____

Final Equipment Seller Name and Address:	Final System Installer Name and Address:

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Lot Number

4. Modifications

Has any of the information in section 2 or 3 above changed? Yes No
If yes note the changes before claiming payment.

_____

_____

_____

_____

5. Payment Assignment

Is payment assigned to another party?

☐ **Yes (Please fill out all the sections below.)**
☐ **No (Please skip Section 5 and complete all others.)**

Assignment Request

I, _____, the designated payee or authorized representative of the payee, hereby assign the right to receive payment for the above noted reservation under the NSHP to the following individual or entity and request that payment be forwarded to this individual or entity at the address below. An STD-204 should be submitted for the person/entity receiving the payment, if not already on record with the Energy Commission.

Name: _____
Address: _____

_____

Phone #: _____

As the designated payee or authorized representative, I understand that I remain responsible for complying with the requirements of the NSHP and will remain liable for any tax consequences associated with the reservation payment, despite the payment's assignment. I further understand that I may revoke this payment assignment at any time prior to the Energy Commission's processing of the payment by providing written notice to the Energy Commission's Renewable Energy Office.

Signature: _____ Date: _____

Name: _____ Title: _____

6. Signatures

The undersigned parties declare under penalty of perjury that the information in this form and the supporting documentation submitted herewith is true and correct to the best of their knowledge. The parties further declare under penalty of perjury that the following statements are true and correct to the best of their knowledge:

(1) The electrical generating system described above and in any attached documents meets the terms and conditions of the Energy Commission's NSHP and has been installed and is operating satisfactorily as of the date stated below.
(2) The electrical generating system described above and in any attached documents is properly interconnected to the utility distribution grid and has or will be issued utility approval to operate the system as interconnected to the distribution grid.
(3) The rated electrical output of the generating system, the physical location of the system, and the equipment identified were installed as stated above.
(4) Except as noted above, there were no changes in the information previously submitted for this system.

The undersigned parties further acknowledge that they are aware of the requirements and conditions of receiving funding under the NSHP and agree to comply with all such requirements and conditions as provided in the Energy Commission's NSHP Guidebook and Overall Program Guidebook as a condition to receiving funding under the NSHP. As specified in the NSHP Guidebook, the undersigned Purchaser authorizes the Energy Commission during the term of the NSHP to exchange information on this form with the electric utility servicing the system in order to verify compliance with the NSHP requirements. If a copy of the utility "letter of authorization to operate" the system is not submitted with this payment claim form, the undersigned Builder understands that he/she is obligated to submit a copy of this letter to the Energy Commission once it is received.

Builder	*Seller*
Print Name _____	Print Name _____
and Title: _____	and Title : _____
Signature: _____	Signature: _____
Date:	Date:

Mail complete payment claim to:	Documents to Attach:	(For options) Mail update to:	Documents to Attach:
California Energy Commission **NSHP, Payment Claim** **1516 Ninth Street (MS-45)** **Sacramento, CA 95814-5512**	• **Final Building Permit Signoff** • **Proof of Payment of Final Invoices** • **Ten-Year Warranty Form** • **Final EPBI/HERS Paperwork** • **Letter of Authorization to Interconnect**	**California Energy Commission** **NSHP, Options Update** **1516 Ninth Street, MS-45** **Sacramento, CA 95814-5512**	• **EPBI Calculations** • **Payee Data Record**

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NSHP-3

TEN-YEAR WARRANTY FORM
NEW SOLAR HOMES PARTNERSHIP

System Information
This warranty applies to the following _____ kW renewable energy electric generating system
Description: _____
Located at: _____

What is Covered

This ten year warranty is subject to the terms below (check one of the boxes):

. **All components of the generating system AND the system's installation.** Said warrantor shall bear the full cost of diagnosis, repair and replacement of any system or system component, at no cost to the customer. This warranty also covers the generating equipment against breakdown or degradation in electrical output of more than ten percent from the originally rated output (PTC rating for modules, manufacturers rating for wind turbines); or

. **System's installation only.** Said warrantor shall bear the full cost of diagnosis, repair and replacement of any system or system component, exclusive of the manufacturer's coverage. (Copies of ten-year warranty certificates for the major system components (i.e., solar modules, wind turbines, etc. and inverter- MUST be provided with this form).

General Terms

This warranty extends to the original purchaser and to any subsequent purchasers or owners at the same location during the warranty period. For the purpose of this warranty, the terms "purchaser," "subsequent owner," and "purchase" include a lessee, assignee of a lease, and a lease transaction. This warranty is effective from _____ (date of completion of the system installation).

Exclusions

This warranty does not apply to:
- Damage, malfunction, or degradation of electrical output caused by failure to properly operate or maintain the system in accordance with the printed instructions provided with the system.
- Damage, malfunction, or degradation of electrical output caused by any repair or replacement using a part or service not provided or authorized in writing by the warrantor.
- Damage malfunction, or degradation of electrical output resulting from purchaser or third party abuse, accident, alteration, improper use, negligence or vandalism, or from earthquake, fire, flood, or other acts of God.

Obtaining Warranty Service

Contact the following warrantor for service or instructions:

Name: _____ Phone: ( )

Company: _____ Fax: ( )

Address: _____

Authorized Representative(s): _____ Date: _____

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NSHP-4

RETAILER REGISTRATION ~~FORM~~

NEW SOLAR HOMES PARTNERSHIP/

CALIFORNIA SOLAR INITIATIVE

This information must be submitted before a company can become eligible to participate in the NSHP. To remain eligible, a company must resubmit this form annually, by March 31. This annual submittal is required even if the information identified in the company's prior NSHP-4 submittal has not changed. In addition, a company must submit an updated NSHP-4 form any time its reported information has changed. The updated NSHP-4 form must be submitted to the Energy Commission within 30 days of the change of any reported information. Registered companies are listed at [www.gosolarcalifornia.ca.gov].

Business name: Address:	Phone: ( ) Fax : ( ) E-mail: Website:
Owner or principal, Title: Business license number: Reseller's license number: Contractor license number (if applicable):	Select one of the following: Corporate, LLC, LLP or other that is registered with the California Secretary of State Not a corporation, LLC or LLP

The above information applies solely to the business identified above:

Print Name: _____ Title:_____

Signature: _____

Date: _____

Send this completed form by telefax to (916) 653-2543 or by mail to:

NSHP Seller Registration
California Energy Commission
1516 9th Street, MS-45
Sacramento, CA 95814-5512

Reminder:
This form must be on file with the Energy Commission for a rebate application with the above company to be considered. It must be resubmitted annually by March 31 for sellers to remain eligible from year to year.

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tilt of the module and the extent to which the system is shaded. The PV calculator, developed by the Energy Commission, accounts for these parameters that are under the control of the builder, as well as the solar and climatic conditions for the locale of the building to determine hourly estimated performance, which is weighted to account for the time-dependent valuation of the electricity that is produced.

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An additional incremental incentive will be provided for qualifying affordable housing projects that meet the program requirements in Chapter IV, Section C.

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The actual incentive for a particular system and installation is dependent on the EPBI calculation of the system's performance compared to the reference system.

Page 14: [4] Deleted **Smiller** **5/21/2007 8:31 AM**

The actual incentive for a particular system and installation is dependent on the EPBI calculation of the system's performance compared to the reference system.

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that meet or exceed the California Flexible Installation criteria

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is dependent on the EPBI calculation of the system's performance compared to the reference system.

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A decline in the incentive rates will occur when a specific volume in capacity has occurred (in MW)

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the funds are no longer reserved

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This section describes the process required to reserve funding from the NSHP. It is currently drafted based upon the current reservation process for the Emerging Renewables Program, administered by the Energy Commission. The Energy Commission is considering an alternative administrative structure in the future. Any changes to the reservation process will be incorporated into a revised guidebook at that time.

A reservation provides the builder assurance that the reserved funds will be available when the payment claim is

made. Only applicants or designated payees who submit complete reservation applications and provide all supporting documentation, as described below, will receive reservation approval. Incomplete applications – those with missing forms, omissions, or discrepancies – will not be approved and may require reapplication. The reservation process will be delayed if incorrect or non-complying information is received.

Funding is available on a first-come, first-served basis for applicants who submit complete and approved applications. Only one reservation and one rebate payment will be allowed for each site during the reservation period

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1. Applicants will not be allowed to submit multiple reservation applications for the same site.

In applications which have only minor omissions or discrepancies that do not affect eligibility or the amount reserved, the Energy Commission/administrator *may* request clarification of information. If the additional information is not supplied within the stated timeframe, the applicant may be notified to reapply. If an applicant re-applies, the complete reservation application and all supporting documentation must be submitted as one package. Failure to do so may cause delays to the reservation process.

---

1 An applicant may only cancel their reservation and re-apply for a new one within the original reservation period if the rebate has dropped at least one level from the rebate granted in the original reservation. A letter explaining the request must be submitted with a new Reservation Application Form signed by the builder. This is designed to discourage applicants from applying too early in the construction process for a system to be installed within the reservation period.

New Housing Development and Multi-Family Development

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The new housing and multi-family development reservation process

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will be granted for applicants who submit complete documentation and follow the procedures as outlined in this section

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for a new housing development or a multi-family development

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The minimum size requirement for multi-family developments is the same: at least 6 units per development and solar on at least 50 percent of the units.

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Eligible projects include multi-family and single-family developments where at least 20 percent of the project units are reserved for extremely low, very low, lower, or moderate income households for a period of at least 45 years. Multi-family projects of all sizes are eligible for a 36-month reservation period and must satisfy the requirements in Section A. The PV systems in multi-family projects must serve only the project units reserved for extremely low, very low, lower, or moderate income households and the manager's unit. The PV systems may serve common areas in a multi-family project only where all of the project's units are reserved for extremely low, very low, lower or moderate income households, except for the manager's unit.

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Single-family developments are subject to the reservation periods, documentation, and progress requirements specified in Section A or B, depending on which category (Section A or B) the development falls within.

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Efficiency Documentation

To participate in the NSHP, the residential buildings must also be highly energy efficient. Documentation showing energy savings for each single family home or multi-family building of at least 15 percent of the combined space heating, space cooling and water heating energy compared to the current Building Energy Efficiency Standards is required for Tier I, and at least 35 percent of the combined space heating, space cooling and water heating energy and 40 percent of the air conditioning energy is required for Tier II. Also, documentation must show that for either Tier I or II, each appliance provided by the builder are

Energy Star labeled if an *Energy Star* designation is applicable for that appliance. Solar water heating may be used to assist in meeting the efficiency requirements of either Tier I or Tier II.

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When systems are installed to serve the energy needs of a project's common areas, the entire affordable housing project must be at least 20 percent more energy efficient than the current standards specified in the current Building Energy Efficiency Standards.

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Applicants must provide the energy efficiency calculations performed by an individual who is a Certified Energy Plans Examiner by the California Association of Building Energy Consultants (CABEC). For a list of Certified Energy Plans Examiners, visit the California Association of Building Energy Consultants

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website at: [http://www.cabec.org/ceperoster.php]

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[http://www.cabec.org/ceperoster.php]

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[www.energy.ca.gov/efficiency/cabec_roster.html].

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Maintenance

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California Association of Building Energy Consultants

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Where to Send Applications

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	Ambient Air Temperature						
	-10 C	0 C	10 C	20 C	30 C	40 C	50 C
Solar Irradiance (W/m²)	14 F	32 F	50 F	68 F	86 F	104 F	122 F
300	645	612	579	545	511	477	443
350	747	708	670	631	592	552	512
400	848	804	759	715	670	625	580
450	946	897	847	796	746	695	645
500	1041	987	932	876	820	764	707
550	1134	1074	1014	953	892	830	768
600	1224	1159	1093	1027	961	894	826
650	1312	1241	1170	1099	1027	955	882
700	1397	1321	1244	1167	1090	1012	934
750	1479	1397	1315	1232	1149	1066	983
800	1557	1470	1382	1294	1206	1117	1029
850	1632	1539	1446	1353	1259	1165	1071
900	1702	1604	1506	1407	1308	1208	1109
950	1768	1665	1561	1458	1353	1248	1144
1000	1831	1722	1613	1504	1395	1285	1175
1050	1980	1775	1661	1547	1432	1318	1203
1100	1980	1824	1705	1586	1467	1347	1228
1150	1980	1980	1746	1622	1498	1374	1249
1200	1980	1980	1784	1656	1527	1397	1268

Page 62: [38] Inserted **Smiller** **5/16/2007 2:03 PM**

aware of the program requirements prior to applying to the program.

Page 63: [39] Inserted **Smiller** **5/16/2007 2:03 PM**

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Supporting Documents to Attach if Builders Have Already Purchased or Committed to Purchase PV:

Equipment Purchase Agreement

Labor Contract (If separate from construction contract)

Final Subdivision Map

Construction Plan-Set
Build-Out Schedule
Energy Efficiency Documentation
EPBI Calculations for each system
System Size Justification (where applicable, or if greater than 5kW/unit)
Payee Data Form (if payee has never received payments from the NSHP before)

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Site Address:	City:	State:	Zip Code: