New Solar Homes Partnership Flexible Installation Calculator User Guide

Updated October 12, 2017

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Introduction

This guide is intended as a complete user manual for how to use the Energy Commission's Flexible Installation (FI) Calculator. The Energy Commission also has available sample calculation runs of different kinds of systems to aid in the use of the tool. These are available on the FI Calculator download page.

The Energy Commission may make updates to this guide should any changes be made to the calculator. Such changes will be outlined on the FI Calculator download page, located at http://www.gosolarcalifornia.ca.gov/tools/nshpcalculator/download_calculator.php.

To install the newest version of the calculator and/or equipment library, download the .msi file from the calculator page. Run the file to install the calculator in the desired location. If a previous version of the calculator was installed, you must first uninstall the previous version of the calculator prior to installing the newer version. You can do this through the "Programs and Features" section of the Windows' Control Panel (there may be differences depending on the version of Windows installed on your computer).

If you have any questions concerning any of the content of this guide, please contact Energy Commission staff using the contact information at the bottom of the calculator download page. For general questions concerning the FI Calculator, please contact the Renewables Call Center by telephone at (916) 653-0237 or via e-mail at renewable@energy.ca.gov.

Getting Started

Calculator Version: 2.0

| Run Individual Calculation | Run Calculation in Bulk |

Equipment Library Version*: Sep-17

*If green, the library is up-to-date, if red a new update is available

| Download and Install Equip Update | Open Bulk Run Spreadsheet |

Instructions

1. Select the "Run Individual Calculation" button above to begin.
2. Select one of the calculation type: Single Family, Multifamily, or Virtual Net-Metered. The Single Family and Multifamily calculation types use different calculations for the 2016 PV compliance credit. The Virtual Net-Metered calculation uses the Multifamily PV credit calculation and asks for additional information for determining the incentive.
3. Enter the details for the calculation into the input window. To select a different calculation type, select the "Go Back" button.
4. If the calculation is for a *2016 Energy Standards* residential project, an additional window will trigger concerning the PV credit from the *2016 Energy Standards* . If the credit was not claimed, check the checkbox. Otherwise, enter all requested information. If the credit was claimed, another window will appear to determine whether there is any equipment outside of the eligible azimuth range that can be used toward the PV credit's minimum size.
5. For Virtual Net-Metered projects, an additional prompt will appear to ask for the allocation percentages for the particular building.
6. From the results page, a new calculation can be completed, or the results printed using the prompt buttons located on the right side of the screen.
7. Use of the Flexible Installation Calculator is subject to the terms and conditions of use of the Go Solar California web site, available at http://www.gosolarcalifornia.ca.gov/use.php and through a link ("conditions of use") on the bottom of the Go Solar California web page.
8. For a complete guide to using this calculator and example runs, please visit http://www.gosolarcalifornia.ca.gov/tools/nshpcalculator/download_calculator.php

Notes

1. To qualify for a NSHP incentive, residential buildings must receive electricity distribution service at the site of installation of the PV system from either Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company, or Golden State Water Company (doing business as Bear Valley Electric Service).
2. Number of Arrays with Unique Azimuths means the number of arrays attached to the same inverter that have a different azimuth value. An example would be a system with panels facing 90, 180, and 270 degrees. Additional array details will be entered later.
3. Number of Sites with Solar means the number of physical addresses where a solar energy system with the same configuration details is proposed to be installed. Typically "1" unless the project is a development.
4. Number of Inverters per Site with Identical Design Details means the number of inverters per site where all installation characteristics of the array are identical. For microinverters, this number will be greater than 1 since it must equal the number of PV modules. If there are multiple inverters that do not share the exact same characteristics, the FI Calculator must be run separately for each unique inverter setup.
5. To determine the Climate Zone of the project, enter the zip code of the project. For help with finding your zip code, please visit https://tools.usps.com/go/ZipLookupAction_input
6. To determine the *Energy Standards* , use the date the building permit for the new residence was applied for. For more information, see Chapter II, Section L of the *NSHP Guidebook, Tenth Edition.*
7. To determine the Energy Efficiency Level of the project, refer to the Title 24 documentation (CF-1R). For more information, see Chapter II, Section L of the *NSHP Guidebook, Tenth Edition.*
8. To enter the equipment, first enter the equipment manufacturer. The results may be filtered down by entering a partial manufacturer name into the Manufacturer Search option.
9. Enter the equipment model. The results will be filtered by the manufacturer entered as well as any partial model names entered into the Model Search.
10. Note that deleting or changing anything you enter into the Search boxes will reset the dropdowns and remove your prior selection.
11. Enter the information for each array in the solar system. Determine whether each array is minimally shaded or not. If not, enter the annual solar access percentage. For more information on shading and calculating solar access, refer to Appendix D of the *NSHP Guidebook, Tenth Edition.*
12. For microinverter systems, enter the total number of modules per array (entered the same way as a string inverter).

The calculator will open on the screen displayed above. A reminder of the basic calculator procedure is on the left side, should you need it. On the right are other important reminders regarding the use of the calculator.

To begin, select one of the buttons, and then move to the appropriate section of this guide.

- Individual Calculation: One FI Calculator run modeling one particular system. The interface is designed to help you with the data entry and contains many controls to prevent you from making errors.
- Bulk Calculation: Multiple FI Calculator runs modeling many different systems. You will enter all of the inputs through a separate spreadsheet. Although faster than completing multiple individual runs, this method bypasses the user interface and makes errors in data entry more likely.

Individual Calculation
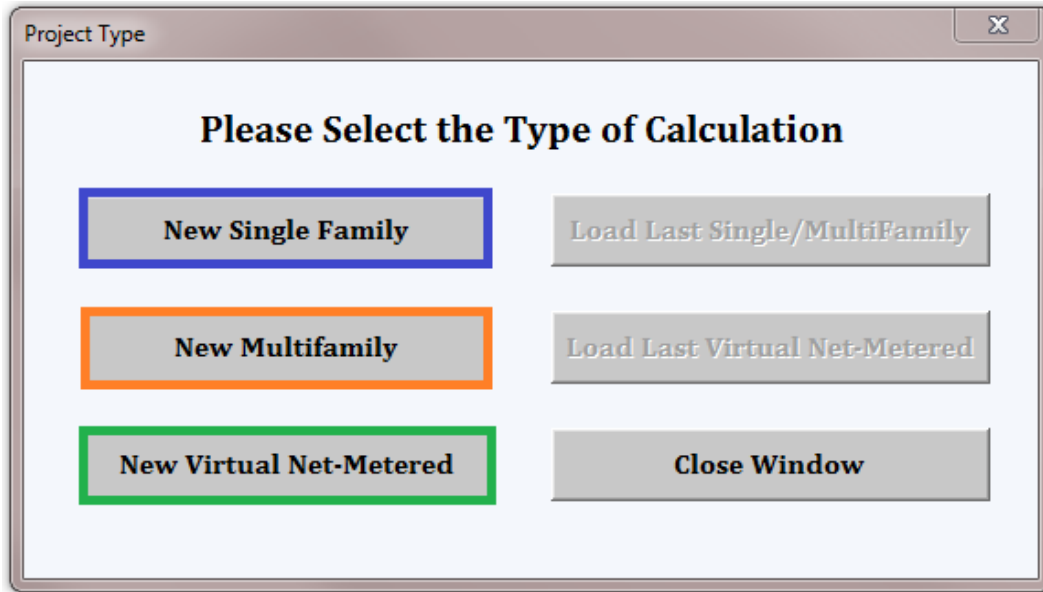
When selecting "Run Individual Calculation," you come to this pop-up. Note that the options to load the last run (on the right side) will become available once you have already completed a calculator run.

- **Single-Family**: Select this option for any project consisting of
  - Stand-alone single family homes, or
  - Duplexes, or
  - Common areas located in a single-family development
- **Multifamily**: Select this option for
  - Multifamily projects where each dwelling unit has its own PV system (such as a townhouse project with a PV system on each townhouse), or
  - Common areas in multifamily developments that have their own standalone system
- **Virtual Net-Metered**: Select this for a project utilizing virtual net-metering. These projects may consist of residential only, common area only, or a mix of both. Some projects that are not virtual net-metered may still be run with this option, such as large common area systems on a shared "house meter".

New Single Family/Multifamily

Main Input

This is the main input screen for single family and multifamily projects.

- The **"Calculator Information"** box (outlined in purple) lists the calculator version, equipment library, and calculation type. Check these before proceeding to ensure that the right calculation type was selected and the most up-to-date tool and library are used.
- **"Project Information"** box (outlined in red) lists the basics of the project.
  - ○ "Calculation Run Name" is the name you give to this calculation run. Note that at the end, this will become the PDF file name, so you will not be able to enter certain special characters (\ / : * ? " < > |).
  - ○ "Zip Code" determines the CEC Climate Zone for the project. You may only enter zip codes from California. If you do not know your zip code, click the link titled

"Find a Zip Code" next to the text box or visit https://tools.usps.com/go/ZipLookupAction_input.

- o "Number of Arrays with Unique Azimuths" determines the number of strings/arrays in the project with different mounting characteristics (azimuth, tilt, shading, etc.). As an example, a project with modules at 90, 180, and 270 degrees would enter "3". Three is the maximum allowed; you must enter any additional arrays into a separate calculator run.
- o "Number of Inverters per Site with Identical Design Details" is the number of inverters on a single house sharing the design details. For string inverters, this will usually be "1". For microinverters or ACPV modules, enter the total number of microinverters or ACPV modules here.

- **"Project and Incentive Type"** (outlined in orange) asks you to select additional particulars of the project, which ultimately determine the appropriate incentive rate.
  - o "*Energy Standards*" refers to which version of the *Building Energy Efficiency Standards* (California Code of Regulations, Title 24, Part 6) the project was permitted under. Refer to Chapter II, Section L of the *NSHP Guidebook, Eleventh Edition* for more information.
  - o "Project Type" requires you to select whether the system serves a residence or a common area.
  - o "Incentive Type" allows you to select whether the project is applying under the market rate or affordable housing incentive structure. Application for the affordable housing incentive structure will require verification of additional requirements per the NSHP Guidebook.
  - o "Energy Efficiency Level" requires you to select whether the project is Code-Compliant, Tier I, or Tier II. You must select an option for the previous three fields first, as the available options for this box are dependent on the ones above.

- **"Equipment Information"** (outlined in blue) is where you select the equipment information. Please be sure to select the manufacturer before selecting the specific model of module or inverter. You can use the search boxes to narrow the results, and the calculator will return results for anything matching the search (even if in the middle of the entry).

- **"Array Details"** (outlined in green) is where you enter the quantity of modules and shading details. If you entered more than "1" for "Number of Arrays" in the "**Project Information**" box, you will need to enter the information for the second and third (if applicable) arrays.
  - o If the array is minimally shaded, enter "Yes". An array is minimally shaded if every obstruction is at a distance from the array of at least two times the height it extends above the array.
    - If the array is not minimally shaded, enter the annual solar access as a number ("1" to "99").
  - o The order you enter the arrays in does not matter for calculation purposes.

Once all required fields are entered, the "Continue" button becomes available.

- *If "Project Type" was entered as "Residential" and "Energy Standards" as "2016", move to the section below titled "PV Compliance Credit".*
- *For other projects, move to "Results"*

PV Compliance Credit

For more information on whether the PV credit was claimed, please refer to the section of this guide titled "Determine if the PV Credit was Claimed" and to Appendix B, Section D of the *NSHP Guidebook, Eleventh Edition.*

The *2016 Energy Standards* include a PV compliance credit ("PV credit") that allows a builder to receive credit toward meeting the requirements of the *2016 Energy Standards* for their solar system. When you select "2016" for the *Energy Standards* and "Residential" for the project type, you will be taken to one of the screens below (see the applicable section for single family or multifamily).

Single Family

For a single family project, you will see the screen above. You will need to refer to the applicable CF-1R to see whether the PV credit was taken and, if it was, to complete the remaining fields. If the credit was not taken or was taken but not needed to meet code, check the box to indicate "PV Compliance Credit Not Claimed," then click "Continue" and move to the "Results" section of this guide.

GENERAL INFORMATION					
01	Project Name	CEC Example House			
02	Calculation Description	New Single Family Home			
03	Project Location	123 Main Street			
04	City	Sacramento, CA	05	Standards Version	Compliance 2017
06	Zip Code	12345	07	Compliance Manager Version	BEMCmpMgr 2016.2.0 (592)
08	Climate Zone	CZ12	09	Software Version	CBECC-Res 2016.2.0 (857)
10	Building Type	Single Family	11	Front Orientation (deg/Cardinal)	0
12	Project Scope	Newly Constructed	13	Number of Dwelling Units	1
14	Total Cond. Floor Area (ft²)	2500	15	Number of Zones	1
16	Slab Area (ft²)	2500	17	Number of Stories	1
18	Addition Cond. Floor Area	N/A	19	Natural Gas Available	Yes
20	Addition Slab Area (ft²)	N/A	21	Glazing Percentage (%)	16.0%

ENERGY USE SUMMARY				
04	05	06	07	08
Energy Use (kTDV/ft²-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	22.18	17.75	4.43	20.0%
Space Cooling	5.49	1.79	3.70	67.4%
IAQ Ventilation	1.06	1.06	0.00	0.0%
Water Heating	8.48	8.48	0.00	0.0%
Photovoltaic Offset	---	-8.41	8.41	---
Compliance Energy Total	37.21	20.67	16.54	44.5%

If the credit was taken, you will use the FI Calculator to determine the compliance size (in kW DC) using equations derived from the *2016 Residential Alternative Calculation Method Reference Manual*[1] (ACM). The FI Calculator will calculate the compliance size using the following inputs, which are found on each CF-1R:

- Climate zone (automatically determined by calculator using zip code)
- Conditioned floor area
- Photovoltaic offset[2] (only if conditioned floor area is greater than 2000 square feet)

The pictures above show the location of these inputs on a single-family CF-1R.

Enter the total square footage of the home (as listed on the CF-1R) into the area in the red box. Note that if the house is 2000 square feet or less, the "Photovoltaic Offset" (orange box) will not be required and you will be able to select the "Continue" button. If the house does exceed 2000 square feet, enter the offset value from the CF-1R (as shown in the screen above). Refer to Chapter II, Section L of the *NSHP Guidebook, Eleventh Edition* for more information. Once done, move to the "**Ineligible Equipment**" section of this guide.

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1 http://www.energy.ca.gov/2015publications/CEC-400-2015-024/CEC-400-2015-024-CMF-REV2.pdf.
2 If the PV credit is claimed in the *2016 Energy Standards*, the photovoltaic offset will always be a negative number.

Multifamily

For a multifamily project, you will see the screen above. You will need to refer to the applicable CF-1R to see whether the PV credit was taken and, if it was, to complete the remaining fields. If the credit was not taken or was taken but not needed to meet code, check the box to indicate "PV Compliance Credit Not Claimed," then click "Continue" and move to the "**Results**" section of this guide.

If the credit was taken, you must determine the compliance size using equations derived from the ACM and requiring the following inputs (found on each CF-1R):

- Climate zone (automatically determined by calculator using zip code)
- Conditioned floor area of the whole building (as modeled on the CF-1R)
- Photovoltaic offset[3]
- Number of dwelling units in the building

GENERAL INFORMATION					
01	Project Name	MF with PV Credit			
02	Calculation Description				
03	Project Location	123 Main Street			
04	City	San Jose, CA	05	Standards Version	Compliance 2017
06	Zip Code		07	Compliance Manager Version	BEMCmpMgr 2016.2.0 (592)
08	Climate Zone	CZ4	09	Software Version	CBECC-Res 2016.2.0 (857)
10	Building Type	Multifamily	11	Front Orientation (deg/Cardinal)	0
12	Project Scope	Newly Constructed	13	Number of Dwelling Units	40
14	Total Cond. Floor Area (ft²)	40000	15	Number of Zones	2
16	Slab Area (ft²)	20000	17	Number of Stories	1
18	Addition Cond. Floor Area	N/A	19	Natural Gas Available	Yes
20	Addition Slab Area (ft²)	N/A	21	Glazing Percentage (%)	5.4%

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3 If the PV credit is claimed in the *2016 Energy Standards*, the photovoltaic offset will always be a negative number.

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ENERGY USE SUMMARY				
04	05	06	07	08
Energy Use (kTDV/ft²-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	3.12	3.74	-0.62	-19.9%
Space Cooling	4.43	10.49	-6.06	-136.8%
IAQ Ventilation	2.16	2.16	0.00	0.0%
Water Heating	28.32	23.24	5.08	17.9%
Photovoltaic Offset	---	-4.22	4.22	---
Compliance Energy Total	38.03	35.41	2.62	6.9%

The pictures above show the location of these inputs on a multifamily CF-1R. Climate zone, conditioned floor area, and number of dwelling units are listed under "General Information"; the photovoltaic offset is listed under the energy use summary.
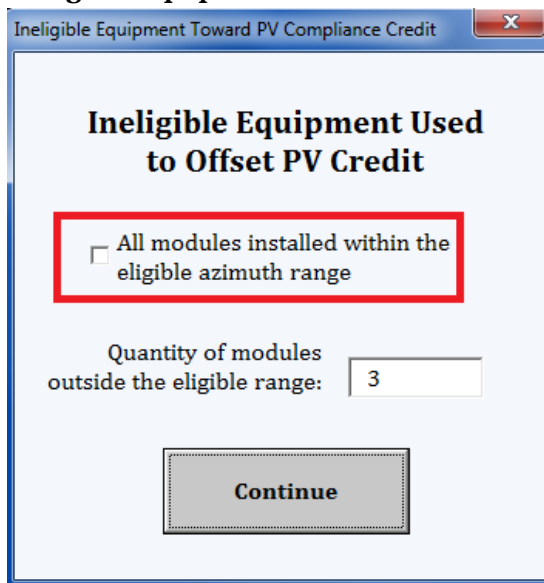
Enter the total square footage of the entire building (as listed on the CF-1R) and the number of dwelling units in the building into the fields in the red box. Last, enter into the "Photovoltaic Offset" field (orange box) the offset value from the CF-1R (as shown in the screen above). Refer to Chapter II, Section L of the *NSHP Guidebook, Eleventh Edition* for more information. Next, move to the "**Ineligible Equipment**" section of this guide.

Ineligible Equipment

If the credit was claimed, the above screen will appear. If the system has any modules installed outside of the 90 to 280 degrees azimuth range, enter that number here. If none were installed, leave the box (in the red outline) checked and click "Continue".

If you entered anything greater than "1" for "Number of Inverters per Site with Identical Design Details" on the "**Main Input**" screen, be sure to enter the total number of ineligible modules, not the number per inverter. The number you enter on this screen is not multiplied by the number of inverters.

Results

NSHP Flexible Installation Certificate of Compliance **NSHP FI-1**

Test Run		3/20/2017	1:53:51 PM
Calculation Name		Calculation Date	Time

95814	12	Feb-17
Zip Code	Climate Zone	Equipment Library

Number of Sites: 1

Inverters Per Site with: Identical Design Details: 1

Calculation Type: **Single Family, Market Rate, Residential**

Efficiency Level: **2016, Code-Compliant**

PV SYSTEM INFORMATION

Inverter Manufacturer and Model: **ABB PVI-3.0-OUTD-S-US (240V)**
Module Manufacturer and Model: **A10Green Technology A10J-M60-240**

Array #1 Module Quantity: 15

Total System Modules: 15

Initial Eligible System Size:	3.07	kW AC Receiving Incentives:	1.81

SHADING

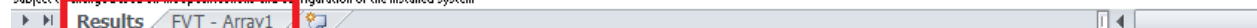| Array #	Minimally Shaded?	Annual Solar Access
1	Yes	100%

CALCULATION RESULTS (incentive based on eligible system size)

Incentive Level	Incentive Rate ($/watt)	Per Site Incentive	Project Incentive
5	$1.25	$2,170	$2,170
6	$1.00	$1,736	$1,736
7	$0.75	$1,302	$1,302
8	$0.50	$868	$868

NOTES

System size receiving incentives reduced by 1.26 kW AC due to claiming of PV credit
PV credit size based on 2450 sq. ft. home
PV credit size reduced by 0.61 kW AC due to installation of 3 ineligible modules

This FIC output form lists the PV features and specifications needed to comply with the current NSHP Guidebook requirements. The PV installation will require installer testing and field verification by an approved HERS Rater. The final NSHP incentive amount paid to the applicant is subject to changes based on the performance and configuration of the installed system

▶ ▶| **Results** / FVT - Array1 / 🔧

Run Another Calculation

Create PDF of Calculation Results (NSHP FI-1)

Create PDF (NSHP FI-1) and HERS Registry Input File (.huf)

Once the calculation is complete, you will see the results displayed in the format of the NSHP FI-1. All of the inputs you entered are recorded, and the incentive for the system is displayed for Incentive Levels 5-8. Note that if you claimed the PV credit, the "kW AC Receiving Incentives" (purple box) will be lower than the "Initial Eligible System Size" to account for the credit. The FI Calculator will add notes (green box) to show how the system size was affected by and which inputs were used to calculate the PV credit. Additional tabs (red box) are also available and contain the tables used for field verification (also known as FVT Tables). An additional tab will display for each array you entered as part of the calculation (maximum three).

From here, you may return to the start page for another calculation, or create a copy of the NSHP FI-1 and .huf digital input file using the buttons on the right side of the screen. **If you do not create a copy, you will not be able to submit these results to the Energy Commission and you will need to redo your calculation.**

Virtual Net-Metered (VNEM)

Main Input

This is the main input screen for virtual net-metered projects.

- **"Calculator Information"** (outlined in purple) lists the calculator version and equipment library. Check these before proceeding to ensure that the most up-to-date tool and library are used.
- **"Project Information"** (outlined in red) lists the basics of the project.
  - ○ "Calculation Run Name" is the name you give to this calculation run. Note that at the end, this will become the file name, so you will not be able to enter certain special characters (\ / : * ? " < > |).
  - ○ "Zip Code" determines the CEC Climate Zone. You may only enter zip codes from California. If you do not know your zip code, click the link next to the text box or visit https://tools.usps.com/go/ZipLookupAction_input.
- The **"Additional Information"** section (outlined in orange) allows you to select additional particulars of the project to determine the appropriate incentive rate to use.
  - ○ "*Energy Standards*" refers to which version of the *Building Energy Efficiency Standards* (California Code of Regulations, Title 24, Part 6) the project was permitted under. Refer to Chapter II, Section L of the *NSHP Guidebook, Eleventh Edition* for more information.

- The "Incentive Type" section allows you to select whether the project is applying under the market rate or affordable housing incentive structure. Application for the affordable housing incentive structure will require verification of additional requirements per the NSHP Guidebook.

Once you enter all of the required fields, you will be able to select the "Continue" button.

Adding or Editing Equipment

This is the screen used to add or edit equipment when completing a VNEM calculation run.

- The "**Summary**" (outlined in purple) lists the unique inverter number of the current system. If you are editing a system, it will show the number of the system that you selected (see the "**Equipment Summary**" section below).
- "**Equipment Information**" (outlined in green) is where you enter the equipment details, such as the specific module and inverter models. Please be sure to select the manufacturer before selecting the model of module or inverter. You can use the search boxes to narrow the results, and the calculator will return results for anything matching the search (even if in the middle of the entry).
  - Enter the "Number of Arrays with Unique Azimuths" to determine the number of strings/arrays in the system with different mounting characteristics (azimuth, tilt, shading, etc.). As an example, a system with modules at 90, 180, and 270 degrees would enter "3". Five is the maximum allowed; you must enter any additional arrays as a separate unique inverter/module system.
  - "Number of Inverters per Site with Identical Design Details" is the number of inverters on the project sharing the design details. For microinverters or ACPV modules, enter the total number of microinverters or ACPV modules here.
- "**Array Details**" (outlined in orange) is where you enter the quantity of modules and shading details. If you entered a number greater than "1" for "Number of Arrays with

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Unique Azimuths" in the "Equipment Information" box, you will need to enter the information for Arrays 2-5 (as applicable)..

- o If the array is minimally shaded, enter "Yes". An array is minimally shaded if every obstruction is at a distance from the array of at least two times the height the obstruction extends above the array.
- o If the array is not minimally shaded, enter the annual solar access as a number ("1" to "99").
- o The order you enter the arrays in does not matter for calculation purposes.

Once you have entered all required fields, you can select the "Save and Return" button. This button takes you to the VNEM Equipment Summary.

Equipment Summary

Calculation Equipment Summary

Module Model	Inverter Model	# Inv	Array #1 # Mods	Array #1 Access	Array #2 # Mods	Array #2 Access	Array #3 # Mods	Array #3 Access	Array #4 # Mods	Array #4 Access	Array #5 # Mods	Array #5 Access
A10I-M60-240	PVI 3.0 OUTD-S-US-Z-M-A (240V)	1	3	65	4	100	5	100	6	90		0

Buttons: View Page 2 of Summary | Add Another System | Go Back to Previous Input | Continue Calculation | Edit Selected System | Selected System: 1

This is the summary of all equipment entered into the calculation so far. From here, you can:

- Enter additional equipment using the "Add Another System" (red outline) button. This will send you to the screen from the "**Adding or Editing Equipment**" section with all fields blank. Upon saving additional equipment, it will appear on the screen pictured above as a new system beneath the equipment entered previously.
- Edit previously entered equipment using the "Edit Selected System" (purple outline) button. First, select the applicable system from the list using the dropdown and then click the button. It will send you to the screen from the "**Adding or Editing Equipment**" section, but with all of the saved information pre-entered into the form. You can then edit the information and save over the existing entries.
- Select the "Continue Calculation" (green outline) button to go to the next step once you have entered all of the equipment.

Up to twenty systems can be entered. If you have entered more than ten, you can view the remaining on page two of the summary using the applicable button (outlined in blue).

Allocation of the PV System

On this screen, you will allocate the energy production of the system. The percentages you enter must match the allocation percentages entered onto the NSHP-1 (Reservation Application Form) and the numbers submitted to the electrical utility.

- The "**Residential Allocation**" (outlined in red) is for solar allocated to the tenants of the project (excluding any on-site manager's unit). If no tenants are served, check the box labeled "Residential Not Served" (cannot be selected if the "Common Area Not Served" box is already checked).
- The "**Common Area Allocation**" (outlined in blue) is for solar allocated to the common areas of the project, such as a manager's unit, leasing office, community room, hallway lighting, etc. (as applicable). If no common areas are served, check the box labeled "Common Area Not Served" (cannot be selected if the "Residential Not Served" box is already checked).
- "**Affordable Housing Residential Information**" (outlined in green) is only required if "Affordable Housing" was chosen as the incentive type back on the "**Main Input**" screen. Choose the applicable energy efficiency level for the income-restricted dwelling units. You will need to enter the number of units with income restrictions and the total number of dwelling units.

o   The number of units with restrictions must be at least 20% of the total number of units to qualify for the affordable housing residential incentive. Only those units with restrictions will receive the higher amount.
o   The number of units with restrictions must be at least 80% of the total number of units to qualify for the higher affordable housing common area incentive. This is not applicable to projects under the *2008 Energy Standards*.

Once all required fields are completed, click "Continue".

- *If the project is under the 2016 Energy Standards and any of the solar is allocated to the residential portion of the project ("Residential Not Served" box was not checked), go to the "PV Compliance Credit" section below*
- *Otherwise, go to the "Results" section located further down.*

PV Compliance Credit

For more information on whether the PV credit was claimed, please refer to the section of this guide titled "Determine if the PV Credit was Claimed" and to Appendix B, Section D of the *NSHP Guidebook, Eleventh Edition*.

The *2016 Energy Standards* include a PV compliance credit ("PV credit") that allows a builder to receive credit toward meeting the requirements of the *2016 Energy Standards* for their solar system. When selecting the *2016 Energy Standards*, if any of the system production is allocated to the residential portion of the project, you will be taken to the screen below.

You will need to refer to the applicable CF-1R to see whether the credit was taken and, if it was, to complete the remaining fields. If the credit was not taken or was taken but not needed to meet code, check the box (outlined in green), click "Continue" and move to the "**Results**" section of this guide.

If the credit was taken, you must determine the compliance size using equations derived from the ACM and requiring additional inputs. Please refer to the "Multifamily" subsection of the "**PV Compliance Credit**" section above for more information.

Enter the total square footage of the entire building (as listed on the CF-1R) and the number of dwelling units in the building into the area in the red box. Last, enter into the "Photovoltaic Offset" field (orange box) the offset value from the CF-1R (as shown in the screen above). Refer to Chapter II, Section L of the *NSHP Guidebook, Eleventh Edition* for more information. Next, move to the "**Ineligible Equipment**" section of this guide.

Ineligible Equipment

If the PV credit was claimed, you will be taken to the above screen. If there are no modules installed outside the 90 to 280 degree azimuth range, leave the box checked (red box) and click "Continue Without Adding" (outlined in green).

If there are modules, select the appropriate inverter from the dropdown (blue box). The calculator will load the module model associated with the inverter you select (based on the systems you entered earlier). Enter the total number of modules (not per inverter, but in sum), and then click "Save and Add" (outlined in purple). If there are ineligible modules for another inverter/module combination, do the same thing. Once you have entered all applicable ineligible modules, check the box and click "Continue Without Adding".

Results

Once completed, you can view the results in the format of the NSHP FI-1 (VNM). All of the inputs you entered are recorded, and the incentive for the system is displayed for Incentive Levels 5-8. You may also select from additional tabs (red box) to view page 2 of the results and the tables used for field verification.

From here, you may return to the start page for another calculation, or create a copy of the NSHP FI-1 (VNM) and .huf digital input file using the buttons on the right side of the screen.

If you do not create a copy, you will not be able to submit these results to the Energy Commission and you will need to re-enter your information.

The results will be displayed by the separate allocations:

- Affordable Housing Residential (purple box): The "kW AC Receiving Incentives" may be lower than the "Initial Eligible System Size" if the PV credit was claimed. All results in

this area will be zeroed out if the incentive type selected was "Market Rate," or if the "Residential Not Served" box from the "**Allocation of the PV System**" section was checked.

- Market Rate Residential (orange box): The "kW AC Receiving Incentives" may be lower than the "Initial Eligible System Size" if the PV credit was claimed. All results in this area will be zeroed out if the incentive type selected was "Affordable Housing" and all dwelling units are restricted, or if the "Residential Not Served" box from the "**Allocation of the PV System**" section was checked.
- Common Area (green box): The displayed incentive will be either market rate or affordable housing depending on the selection made in the "**Main Input**" section.
  - If you selected "Affordable Housing" but the project is under the *2008 Energy Standards* or less than 80% of the units are restricted, this section defaults to market rate.

To calculate the total incentive of the project, add the incentive amounts from each allocation incentive table, using the correct incentive level as applicable.

NSHP Flexible Installation Certificate of Compliance — NSHP FI-1 (VNM)

Test
Calculation Name

3/20/2017 — Calculation Date

3:13:35 PM — Time

MODULE BREAKDOWN BY ALLOCATION

Residential - Affordable Housing: 0   Residential - Market Rate: 102   Common Area: 18

EQUIPMENT DETAILS

						Per Inverter Details											
						Array 1		Array 2		Array 3		Array 4		Array 5		Total
#	Inverter Manufacturer and Model	Total	Module Manufacturer and Model	Total	Qty	Access	Qty	Access	Qty	Access	Qty	Access	Qty	Access	Ineligible
1	ABB PVI-3.0-OUTD-S-US (240V)	10	A10Green Technology A10J-M60-240	120	12	100%									20
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															

SUMMARY

Total Initial Eligible System Size: 24.57
Total kW AC Receiving Incentives 19.88

NOTES
Residential system size receiving incentives reduced by 4.69 kW AC due to claiming of PV credit
PV credit size based on 12000 sq. ft., 10 unit building with -4.5 offset
PV credit size reduced by 4.1 kW AC due to installation of 20 ineligible modules

| VNM Results | **VNM Results 2** | VNM FVT Tables |

Page 2 of the results shows all of the equipment you entered as part of the calculation, as well as any applicable notes. As with the single family and multifamily results, the "Notes" (purple box) section shows how the system size was affected and what inputs were used to calculate the PV credit.

The "**Equipment Details**" will show a complete breakdown, including:

- The total number of inverters and modules per each unique model (outlined in red). The number of modules per inverter is multiplied by the number of inverters (if each

inverter had ten modules and ten inverters were entered, the summary would show "100" and "10," respectively).

- The number of modules per array per inverter (outlined in blue). These numbers are not multiplied by the number of inverters, so the sum for each row will not equal the total number of modules (using the previous example, "Array 1" might have five modules and "Array 2" list five modules since each inverter has only ten modules).
- The number of ineligible modules (outlined in green). If not applicable, the boxes will remain empty. These are the numbers you entered in the **"Ineligible Equipment"** section and are not multiplied by the number of inverters.

Bulk Run Calculations

For those users that are more familiar using the FI Calculator, you may use the "Run Calculation in Bulk" option to complete multiple runs at a time. This can only be used for single family and multifamily projects and **cannot be used for VNEM projects**.

NOTE: This option has minimal controls and error protections in place. Should you have difficulty running the calculation in bulk, you can still use the individual calculation option.

Before starting, you must enter all of the calculation information into the "FIC_Bulk_Run_Spreadsheet.xlsm" Excel file that came with the calculator.

Under the "System Input" tab the following fields need to be completed.

	LIBRARY VERSION:	Sep-17		
Calc Run Name	Zip Code	Calc Type	Number of Arrays	Number of Sites
System 1	95820	SF	1	25
System 2	95821	SF	1	25

- You need to enter the name of the calculator, zip code, calculation type, the number of arrays, and the number of sites.
    - o The Zip Code entered will need to be one from the list on the energy website, which can be found by using the following link, http://www.energy.ca.gov/maps/renewable/BuildingClimateZonesByZIPCode.pdf
    - o Single Family (SF) or Multiple Family (MF) are the only options to enter for the Calculation Type.
    - o The maximum number of arrays per calculation is 3. Each set of modules with different mounting characteristics is a separate array for calculation purposes.

Building Standards			
Version	Energy Efficiency Level	Project Type	Incentive Type
2016	Code-Compliant	Residential	Market Rate
2016	Code-Compliant	Residential	Market Rate

- The next fields to complete are the version of the building standards, Energy Efficiency Level, project type, and the incentive type.
    - o The Building Energy Standards can be 2008, 2013, or 2016.
    - o For the 2008 Building Energy Standards only the following tiers qualify
        - ▪ Market Rate: Tier I, Tier II
        - ▪ Affordable Housing: Tier I or II
    - o For the 2013 Building Energy Standards only the following tiers qualify
        - ▪ Market Rate: Code-Compliant, Tier I, Tier II
        - ▪ Affordable Housing: Code-Compliant, Tier I or II
    - o For the 2016 Building Energy Standards only the following tiers qualify
        - ▪ Code-Compliant
    - o The Project Type can either be Residential or Common Area.
    - o The Incentive Type can only be either Market Rate or Affordable Housing
        - ▪ Affordable Housing may be selected only for projects meeting the additional Affordable Housing requirements

Equipment		
Inverter	Number of Inverters	Module
ABB|PVI-3.0-OUTD-S-US-Z (240V)	1	SunPower|SPR-230NE-BLK-D
ABB|PVI-3.0-OUTD-S-US-Z (240V)	1	SunPower|SPR-230NE-BLK-D

- The inverter, number of inverters, and the module are the next fields to input.
  - If the inverter is a microinverter then enter the total number of microinverters into the number of inverters field.
  - The module model used must be the same for each array.

Array 1		Array 2		Array 3		2016 Standards Only
Quantity	Solar Access	Quantity	Solar Access	Quantity	Solar Access	# Ineligible Modules
20	100					
24	100					

- The last of the fields to be completed under the "System Input" tab are the arrays and the number of ineligible modules.
  - If there are multiple arrays for a single calculator then each array section will need to be completed with the number of modules per each array and the solar access percentage.
    - Enter "100" for solar access for minimally shaded arrays
  - The number of ineligible modules field is only for the 2016 projects.
    - The number of ineligible modules should be the modules that were not included in the calculation and outside the azimuth range of 90-280 degrees.

Under The "Plan Input (2016) tab, the following fields will need to be completed only for projects subject to the 2016 Building Energy Efficiency Standards.

Enter Building Plan (CF-1R) Details Here Only for 2016 Standards Plans Where the PV Credit is Claimed			
Building Plan Name	Square Footage	PV Offset	# of Dwelling Units
All Plans 2000 square feet or less	1800		
Plans greater than 2000 square feet	2200	-2.4	

- Any building plans where the PV credit was claimed will need to be entered. Complete the fields for the building plan name, square footage, the PV offset, and the number of dwelling units.
  - Single family plans 2000 square feet or less will only need to complete the plan name and square footage fields.
  - Single family plans greater than 2000 square feet will need to complete the plan name, square footage and the PV Offset fields.
  - Multifamily plans need to complete all fields.
  - The square footage and PV Offset can be obtained from the CF-1R form.
  - The incentive for each system in the "System Input" tab will be calculated for all plans entered in the "Plan Input (2016)" tab.

NOTE: Do not rename this file or the bulk calculation will not work.

Once you enter all of the relevant details, leave the bulk run file open while selecting the "Run Calculation in Bulk" button in the FI Calculator. The following pop-up will appear:
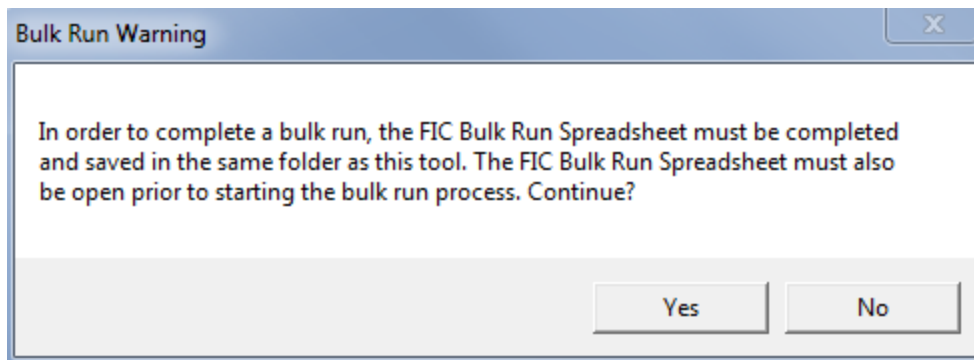
Select "Yes" to continue, or "No" to cancel. The calculation will commence and will iterate through all of the entries. It will automatically generate the PDF of the NSHP FI-1 and the .huf file for each run.

If an error is encountered at any point, the following warning will appear:
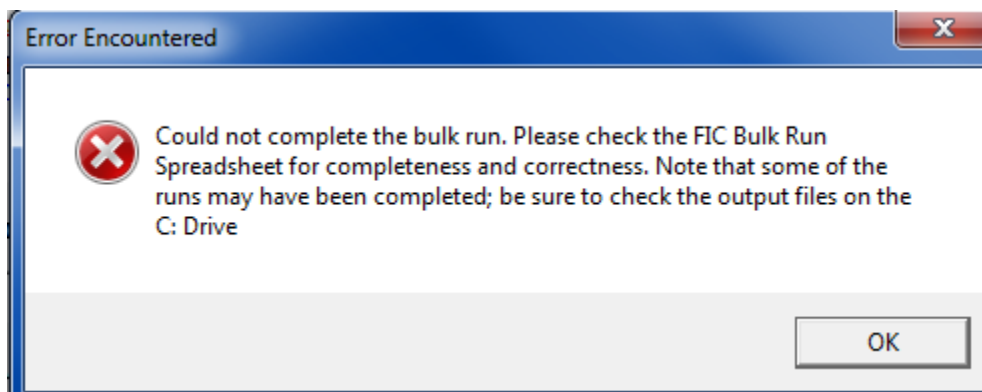
The calculation will subsequently abort, cancelling any runs that were not completed prior to encountering the error.

95820		12		Sep-17	
Zip Code		Climate Zone		Equipment Library	

Number of Sites: 25   **Inverters Per Site with:** 1
Identical Design Details

Calculation Type: Single Family, Market Rate, Residential

Efficiency Level: 2016, Code-Compliant

PV SYSTEM INFORMATION

Inverter Manufacturer and Model: ABB PVI-3.0-OUTD-S-US-Z (240V)
Module Manufacturer and Model: SunPower SPR-230NE-BLK-D

Array #1 Module Quantity: 10

Total System Modules: 10

Initial Eligible System Size: 2.02   **kW AC Receiving Incentives:** 2.02

SHADING

Array #	Minimally Shaded?	Annual Solar Access
1	Yes	100%

CALCULATION RESULTS

Incentive Level	Incentive Rate ($/watt)	Per Site Incentive	Project Incentive
6	$1.00	$1,944	$48,600
7	$0.75	$1,458	$36,450
8	$0.75	$1,458	$36,450

NOTES
PV credit claimed on CF-1Rs; see additional pages for adjusted incentives

This FIC output form lists the PV features and specifications needed to comply with the current NSHP Guidebook requirements. The PV installation will require installer testing and field verification by an approved HERS Rater. The final NSHP incentive amount paid to the applicant is subject to change based on the specifications and configuration of the installed system

For current incentive level, please visit: https://www.newsolarhomes.org/WebPages/Public/RebateLevelView.aspx

FI Calculator 2.0

Once the calculation is complete, you will see the results of the information inputted and at the bottom will be a note stating "PV credit claimed on CF-1Rs; see additional pages for adjusted incentives" highlighted in the red box above. The incentive noted on this page is for the system with no PV credit claimed.

System 1		9/28/2017	11:41:40 AM
Calculation Name		Calculation Date	Time

Building A
Plan Name

2450	3.2		0.26
Square Footage	PV Offset		kW AC Incentivized

Incentive Level	Incentive Rate ($/watt)	Per Site Incentive	Project Incentive
7	$0.75	$190.00	$4,750.00
8	$0.75	$190.00	$4,750.00

Building B
Plan Name

1900	2.4		0.26
Square Footage	PV Offset		kW AC Incentivized

Incentive Level	Incentive Rate ($/watt)	Per Site Incentive	Project Incentive
7	$0.75	$190.00	$4,750.00
8	$0.75	$190.00	$4,750.00

Building C
Plan Name

2650	1.5		0.26
Square Footage	PV Offset		kW AC Incentivized

Incentive Level	Incentive Rate ($/watt)	Per Site Incentive	Project Incentive
7	$0.75	$190.00	$4,750.00
8	$0.75	$190.00	$4,750.00

Building D
Plan Name

1800	3.1		0.26
Square Footage	PV Offset		kW AC Incentivized

Incentive Level	Incentive Rate ($/watt)	Per Site Incentive	Project Incentive
7	$0.75	$190.00	$4,750.00
8	$0.75	$190.00	$4,750.00

The above results are the adjusted system incentives for the plans that claimed the PV Credit. Additional pages will be generated to accommodate all of the plans entered.

Determine if the PV Credit was Claimed

The PV credit is available only for low-rise residential buildings (up to three stories), which are modeled on a certificate of compliance (CF-1R). High-rise residential (more than three stories) or nonresidential buildings, which are modeled on a PERF-1, do not have the PV credit available.

Furthermore, the PV credit is available in 14 out of 16 climate zones. Climate Zones 6 and 7 cannot claim the PV credit in the Title 24 compliance documentation. For a list of climate zones by zip code, please refer to http://www.energy.ca.gov/maps/renewable/BuildingClimateZonesByZIPCode.pdf.

When the PV credit is claimed on the CF-1R, the energy use summary will display a negative value under the Proposed Design of the Photovoltaic Offset row (see below). Unless otherwise notified by the applicant, the Energy Commission will assume that any building that claims the PV credit on the CF-1R has used the PV credit to comply with the minimum requirements of the *2016 Energy Standards*.

ENERGY USE SUMMARY				
04	05	06	07	08
Energy Use (kTDV/ft^2-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	22.18	17.75	4.43	20.0%
Space Cooling	5.49	1.79	3.70	67.4%
IAQ Ventilation	1.06	1.06	0.00	0.0%
Water Heating	8.48	8.48	0.00	0.0%
Photovoltaic Offset	----	-8.41	8.41	----
Compliance Energy Total	37.21	20.67	16.54	44.5%

In some circumstances, the PV credit may be claimed and integrated into the energy model on the CF-1R, but may not be needed to meet the required reduction in energy budget. It is the applicant's responsibility to determine whether the PV credit is needed to meet the *2016 Energy Standards* and to notify the Energy Commission if the credit only provides TDV reductions above and beyond what is needed to comply. The below sections provide guidance on how to determine if the credit was needed for compliance.

Single Orientation Plan

ENERGY USE SUMMARY				
04	05	06	07	08
Energy Use (kTDV/ft²-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	22.18	17.75	4.43	20.0%
Space Cooling	5.49	1.79	3.70	67.4%
IAQ Ventilation	1.06	1.06	0.00	0.0%
Water Heating	8.48	8.48	0.00	0.0%
Photovoltaic Offset	----	-8.41	8.41	----
Compliance Energy Total	37.21	20.67	16.54	44.5%

For a plan that is unique to a specific orientation of home, the CF-1R will display an energy use summary similar to the above. In this case, the energy budget reflects only the unique orientation entered as part of the energy model.

To determine if the credit was needed, compare the compliance margin of the Photovoltaic Offset (in the red box) with the Compliance Energy Total margin (in the green box). If the compliance margin for the Compliance Energy Total is larger than the margin provided by the Photovoltaic Offset then the credit was not needed to comply with the *2016 Energy Standards*. An alternative would be to see if the difference of the Compliance Energy Total margin and Photovoltaic Offset margin is greater than zero.

The credit is not needed if either is true:

- (Compliance Energy Total margin) > (Photovoltaic Offset margin)
- (Compliance Energy Total margin) – (Photovoltaic Offset margin) > 0

Should the model not meet the above, the credit is needed for the model to remain compliant with the *2016 Energy Standards* and must be factored into the FI incentive calculation.

Multiple Orientation Plan

ENERGY USE SUMMARY				
Energy Use (kTDV/ft^2-yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	4.84	4.04	0.80	16.5%
Space Cooling	6.14	4.39	1.75	28.5%
IAQ Ventilation	1.13	1.13	0.00	0.0%
Water Heating	9.25	9.25	0.00	0.0%
PV Credit	----	-5.87	5.87	----
North Facing Compliance Total	21.36	12.94	8.42	39.4%
Space Heating	4.84	5.15	-0.31	-6.4%
Space Cooling	6.14	7.59	-1.45	-23.6%
IAQ Ventilation	1.13	1.13	0.00	0.0%
Water Heating	9.25	9.25	0.00	0.0%
PV Credit	----	-5.87	5.87	----
East Facing Compliance Total	21.36	17.25	4.11	19.2%
Space Heating	4.84	5.13	-0.29	-6.0%
Space Cooling	6.14	3.44	2.70	44.0%
IAQ Ventilation	1.13	1.13	0.00	0.0%
Water Heating	9.25	9.25	0.00	0.0%
PV Credit	----	-5.87	5.87	----
South Facing Compliance Total	21.36	13.08	8.28	38.8%
Space Heating	4.84	5.09	-0.25	-5.2%
Space Cooling	6.14	6.98	-0.84	-13.7%
IAQ Ventilation	1.13	1.13	0.00	0.0%
Water Heating	9.25	9.25	0.00	0.0%
PV Credit	----	-5.87	5.87	----
West Facing Compliance Total	21.36	16.58	4.78	22.4%

Subdivision projects often use plans generated using the multiple orientation option, in which case the energy model will calculate the energy use for the home oriented in the four cardinal directions. The energy use summary will display the reduction in energy budget for each of the four orientations (see the above); all four orientations must meet the Energy Standards for the plan to be used for compliance.

To determine if the credit is needed, the procedure is similar to the above, except each of the four orientations must meet the criteria. In the example, the north and south orientations meet the criteria; however, the east and west orientations do not. In this case, the credit is required to meet the Energy Standards in some orientations of this home and the credit must be factored into the incentive calculation.