

## **2019 CALIFORNIA ENERGY CODE for a SINGLE FAMILY RESIDENCE using HEED**

### **New Performance Requirements in the 2019 Code:**

The 2019 California Residential Energy Code (Title 24) has basically two important new requirements, FIRST to design a more Energy Efficient Building, and SECOND to add the required amount of Solar Electric Generation (PV).

### **How Energy Efficiency is Calculated for a Proposed Building:**

A building's energy efficiency is the yearly amount of energy (kBTU or kWh) it uses. The Code requires that the energy efficiency of your proposed building needs to be better than the energy efficiency of a basic reference building that just barely meets the current 2019 Code.

In the California Code, energy efficiency is called the Energy Design Rating (EDR) which is calculated using a special Time Dependent Valuation (TDV) climate data file that is modified to account for source energy time of use (TOU). On the other hand, HEED calculates energy efficiency using the more widely accepted Energy Use Intensity (EUI) using actual TMY climate data and actual utility rates. Using HEED you can select TMY climate data for any of California's 16 climate zones or for any other northern hemisphere location which you can download from HEED's web site. Also you can input your actual utility rates including TOU pricing. HEED automatically creates your basic reference building (Scheme 2) and calculates its EUI. If your final design uses less EUI it will meet the Code. This is similar to comparing the EDR ratings of the two buildings.

### **Creating a Basic Reference Building for the 2019 California Energy Code in HEED:**

In HEED the Scheme 1 Basecase Building will meet the prior 2016 Energy Code, and the Scheme 2 More Energy Efficient Building will closely approximate basic reference building for the 2019 Energy Code.

In fact HEED Scheme 2 is slightly more efficient than the 2019 Code Standard Energy Design Rating (EDR). For example, the Code requires 2x6 framing with a U-factor of .048 or .065 while HEED Scheme 2 has 2x6 walls with a U-factor of .047 or .065 (see 150.0(c)2). Both HEED and the Code include the modifications to indoor air quality requirements of ASHRAE 62.2. Both HEED and the Code require Fan Efficiency of 0.58 watts/cubic feet per minute for air handling units that are not gas furnaces (for Gas furnaces change this to 0.45 on HEED's HVAC screen).

You can copy Scheme 2 to a new Scheme 3 and make any of these changes or any others to create a basic reference building for the 2019 Code.

## How the Required Amount of Photovoltaics (PV) is Calculated using HEED:

The SECOND of California's 2019 Performance Code requirements is to add the required amount of Solar Electric Generation (PV).

Starting with HEED's new Scheme 3 which meets the 2019 Code's FIRST requirement, add the required amount of PV to meet the SECOND requirement. As you copy this Scheme 3 to create better Schemes you cannot tradeoff more PV for less energy efficiency, but you can add more efficiency and more PV to try to create a Zero Net Energy building (see HEED's Home Energy Rating screen).

To find the required minimum number of PV panels you will need to hand-calculate your building's minimum Code required kW of PV using the following equation, then divide by HEED's nominal 200 watts per panel, round off, and load the Number of PV panels into HEED's Advanced PV Power Design screen:

$$\text{kW of PV} = (\text{CFA} \times \text{A} / 1000) + (\text{NDwell} \times \text{B})$$

$$\text{Number of PV Panels} = \text{kW of PV} / (0.200 \text{ kW per HEED default panel})$$

- CFA is Conditioned Floor Area in SQ.FT

- NDwell is Number of Dwelling Units (1 for a Single Family home)

Climate Zone	A	B	Climate Zone	A	B
1	.793	1.27	9	.631	1.36
2	.621	1.22	10	.627	1.41
3	.628	1.12	11	.836	1.44
4	.586	1.21	12	.613	1.40
5	.585	1.06	13	.894	1.51
6	.594	1.23	14	.741	1.26
7	.572	1.15	15	1.56	1.47
8	.586	1.37	16	.590	1.22

If your new panels are better than the default 200 watt panels, you can reduce their total number of panels by the ratio of 200 to the new wattage.

## SUMMARY

The ultimate OBJECTIVE is to design a home that uses ZERO NET ENERGY, so with each new Scheme you can make changes to dozens of other variables and see how close you get to zero EUI on the Building Energy Rating screen.

HEED is intended to be an early phase Design Tool to help you reach Zero Net Energy. Using HEED should easily meet these two new Code requirements; FIRST to design a very Energy Efficient Building, and SECOND to add the required amount of Solar Electric Generation (PV). If you want to get a building permit in California you will also have to run your final design through the California Energy Commission's CBECS software to prove that it satisfies all the minimum Code requirements.