







Solar Heat Sizing

Method 1

- **Load Analysis for SDHW - # of gallons hot water/ day**
- **.75-1.0 square foot collector surface area / gallon**

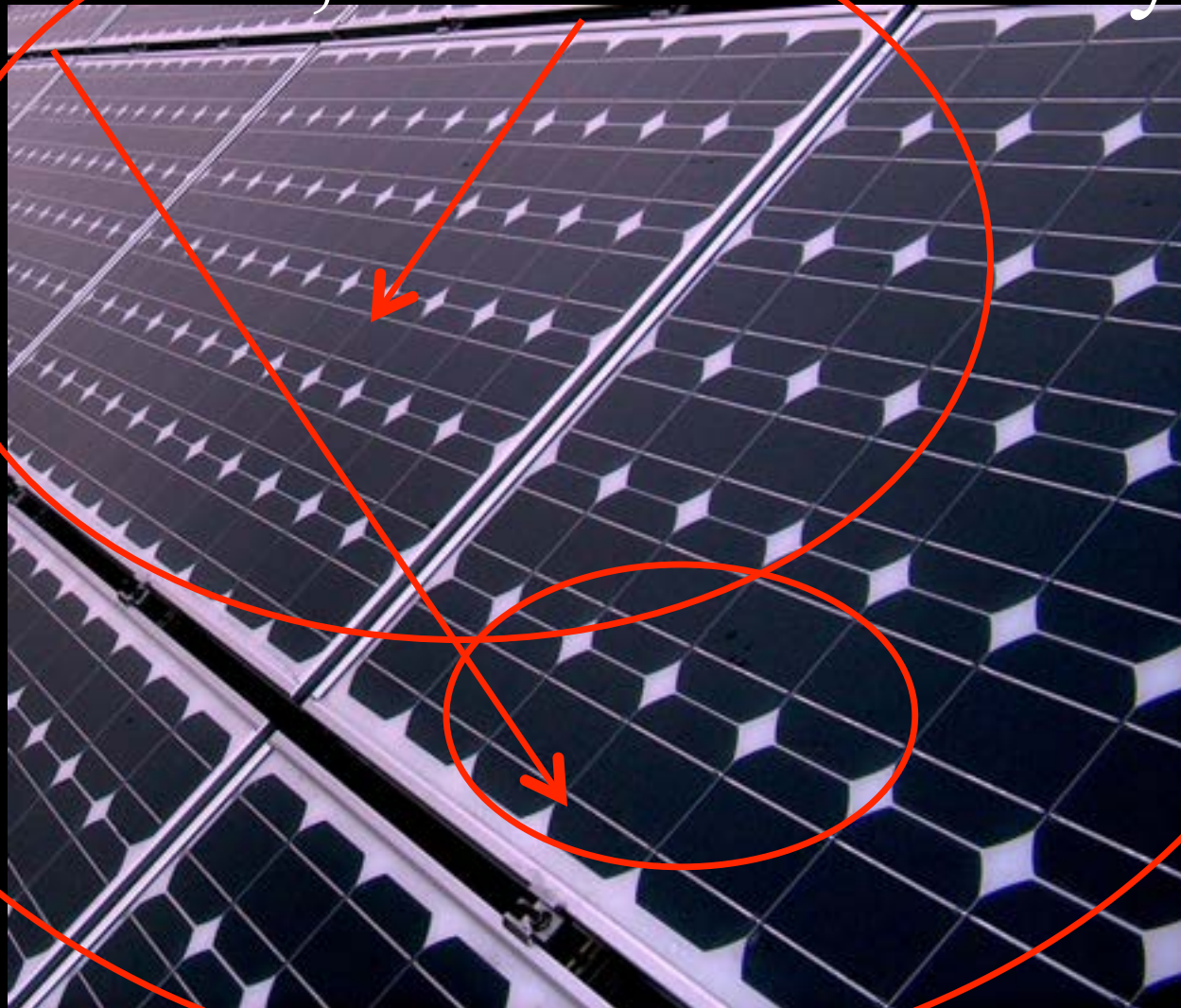
Method 2

- **Load Analysis**
- **(Wc) (Ts-Ti) (Cp) 8.33**
- **(65) (70) (1 BTU/lb. F) 8.33 = 37901.5 btus**
- **Array Sizing**
- **PSH (4.3) / 10.76 = .399 kWh / sq. ft. / day**
- **.399 x 3413 = 1361 BTUs / sq. ft. / day**
- **Match with thermal collector rating**

An aerial photograph of a vast solar farm, showing multiple rows of photovoltaic panels stretching across a landscape. The panels are dark with a grid of silver lines. The perspective is from a high angle, looking down at the rows. The text "Solar Electricity" is overlaid in the center in a bold, blue, italicized font, enclosed in a thin orange rectangular border.

Solar Electricity

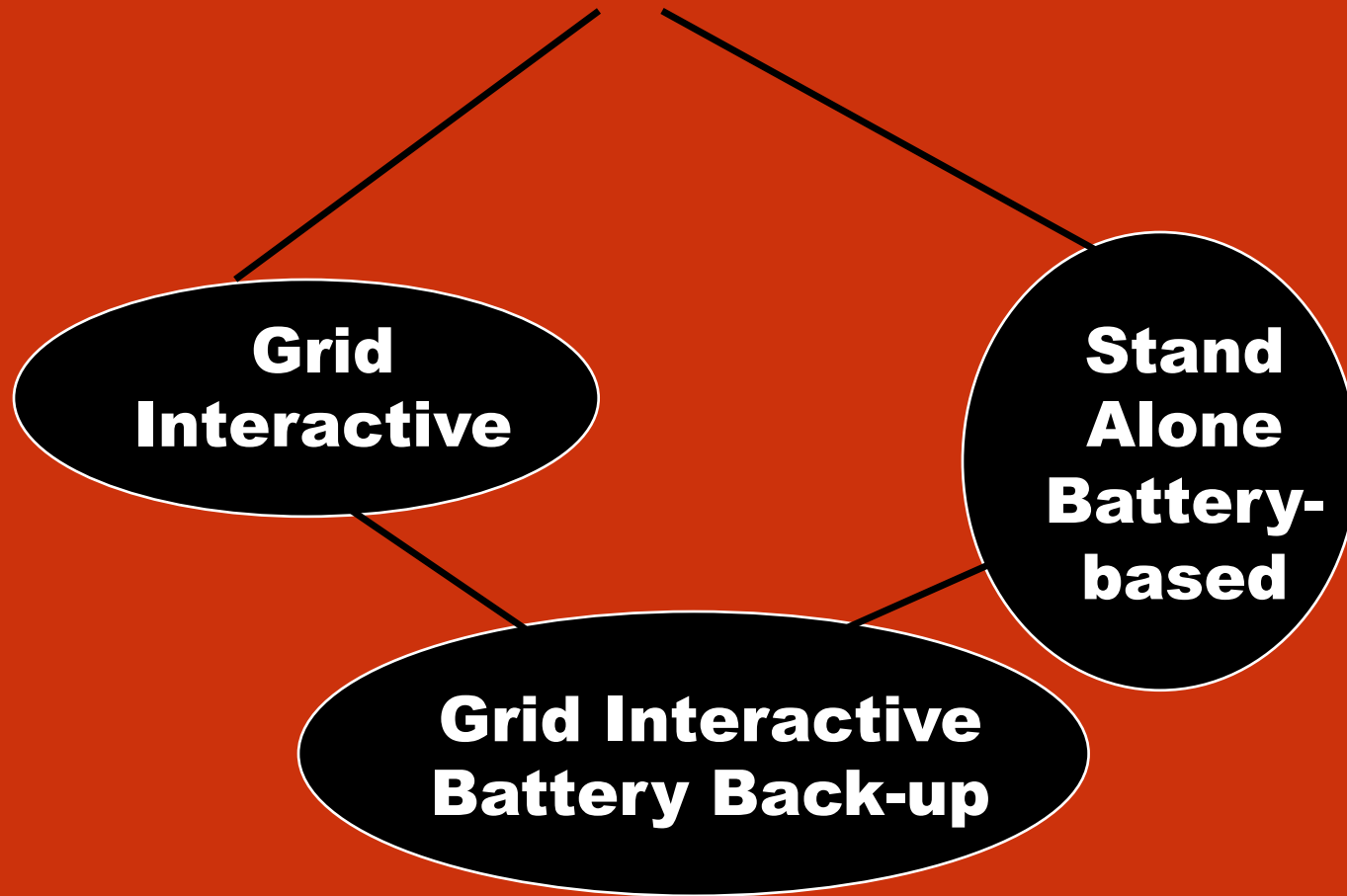
PV Cell, Module and Array



Types of PV Modules

- 1. Mono-crystalline Si**
- 2. Poly-crystalline Si**
- 3. Amorphous Si**
- 4. CIGS**
- 5. CdTe**

Types of Solar Electricity

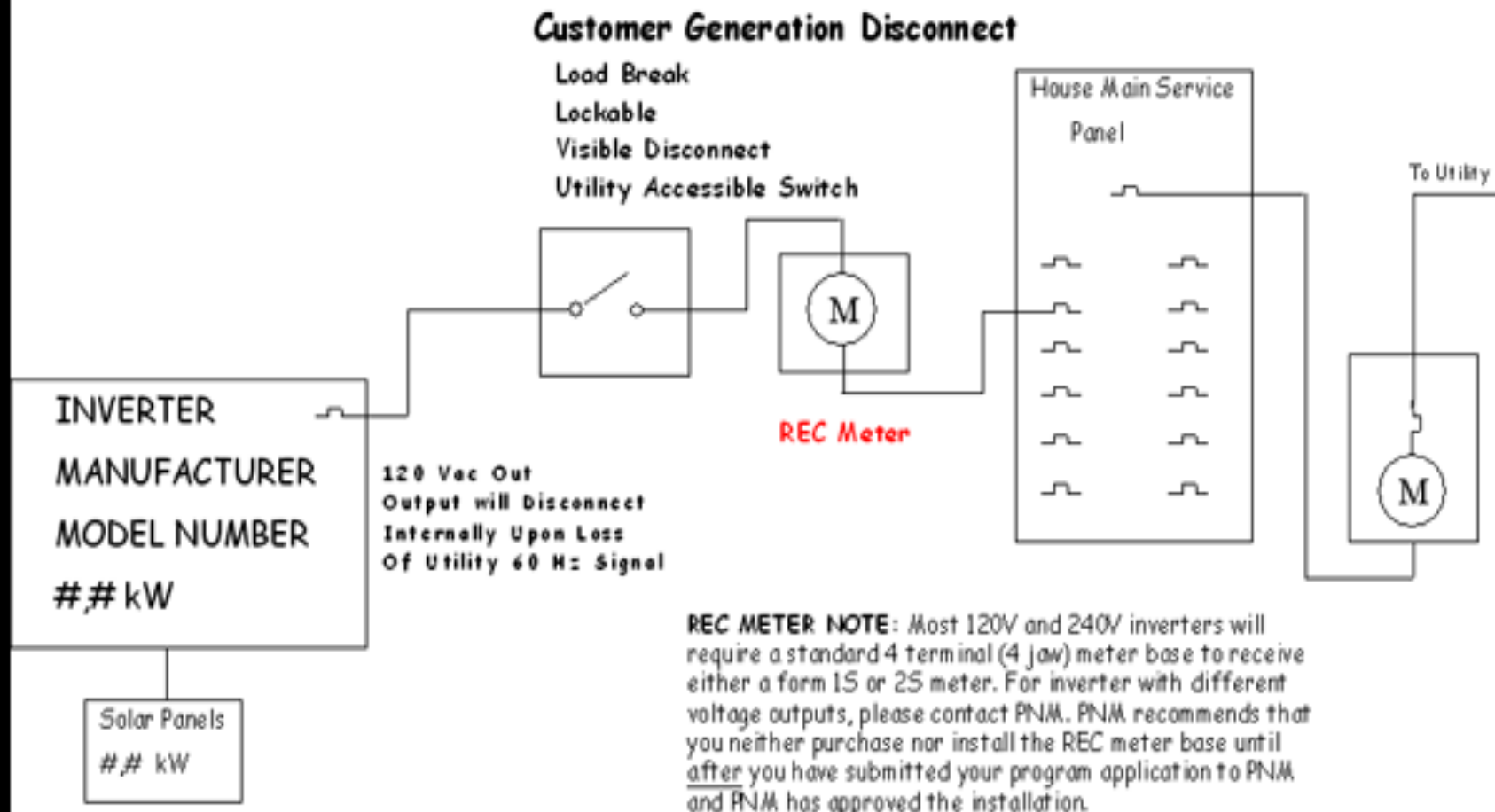


Grid-Interactive Solar Electric System

- **Rebates**
- **Battery Free**
- **Flexible budgeting**



SAMPLE ONE-LINE DIAGRAM: GRID-TIED SYSTEM



**If the grid goes down,
so do you!**



Stand-alone Battery- Based System



Pros

If grid power not available

Self-reliance

Cons

Batteries require maintenance and care

System sizing demanding



Balance of System

Grid-tie Battery Back-up Balance of System



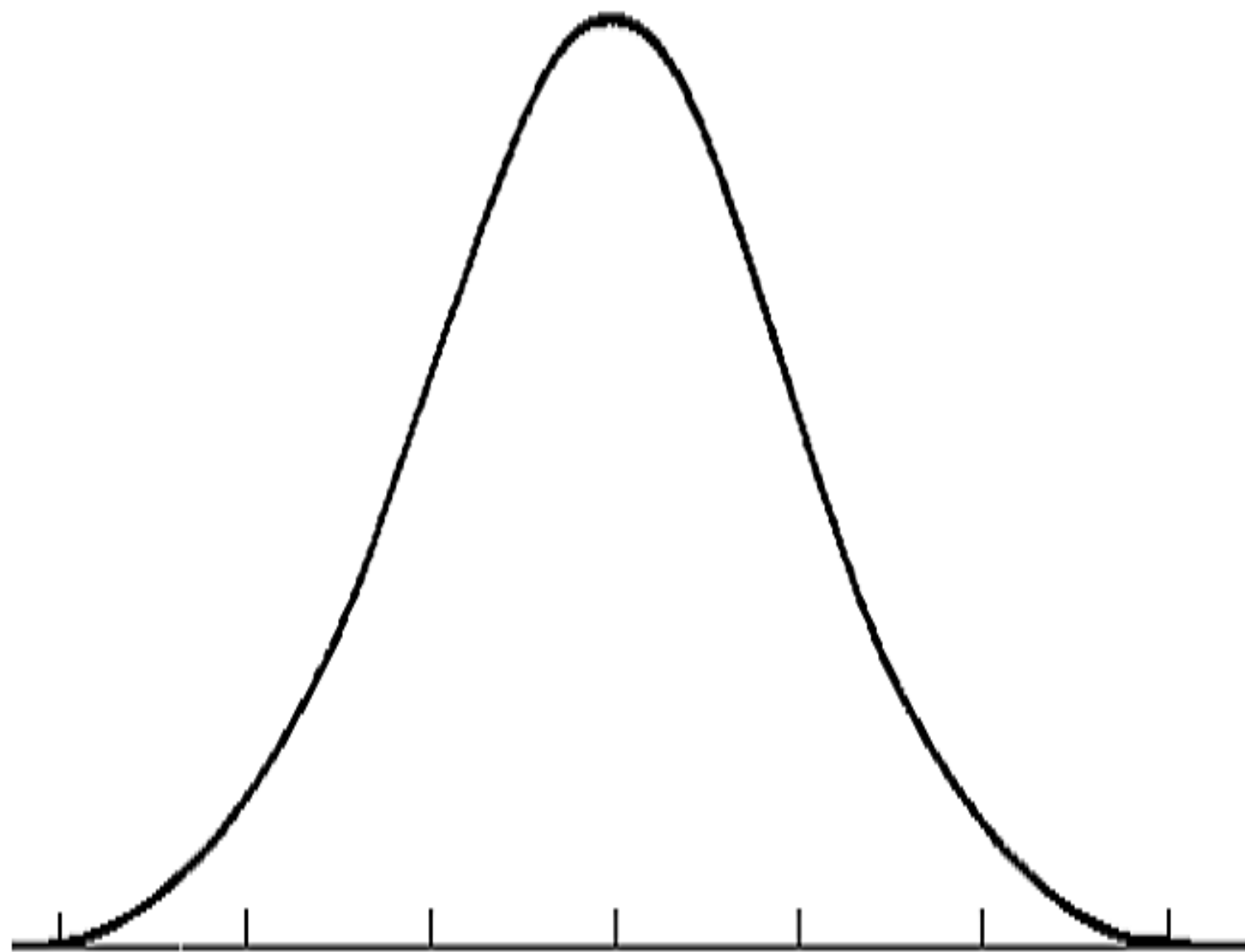
The Snowy Climate Reality Check



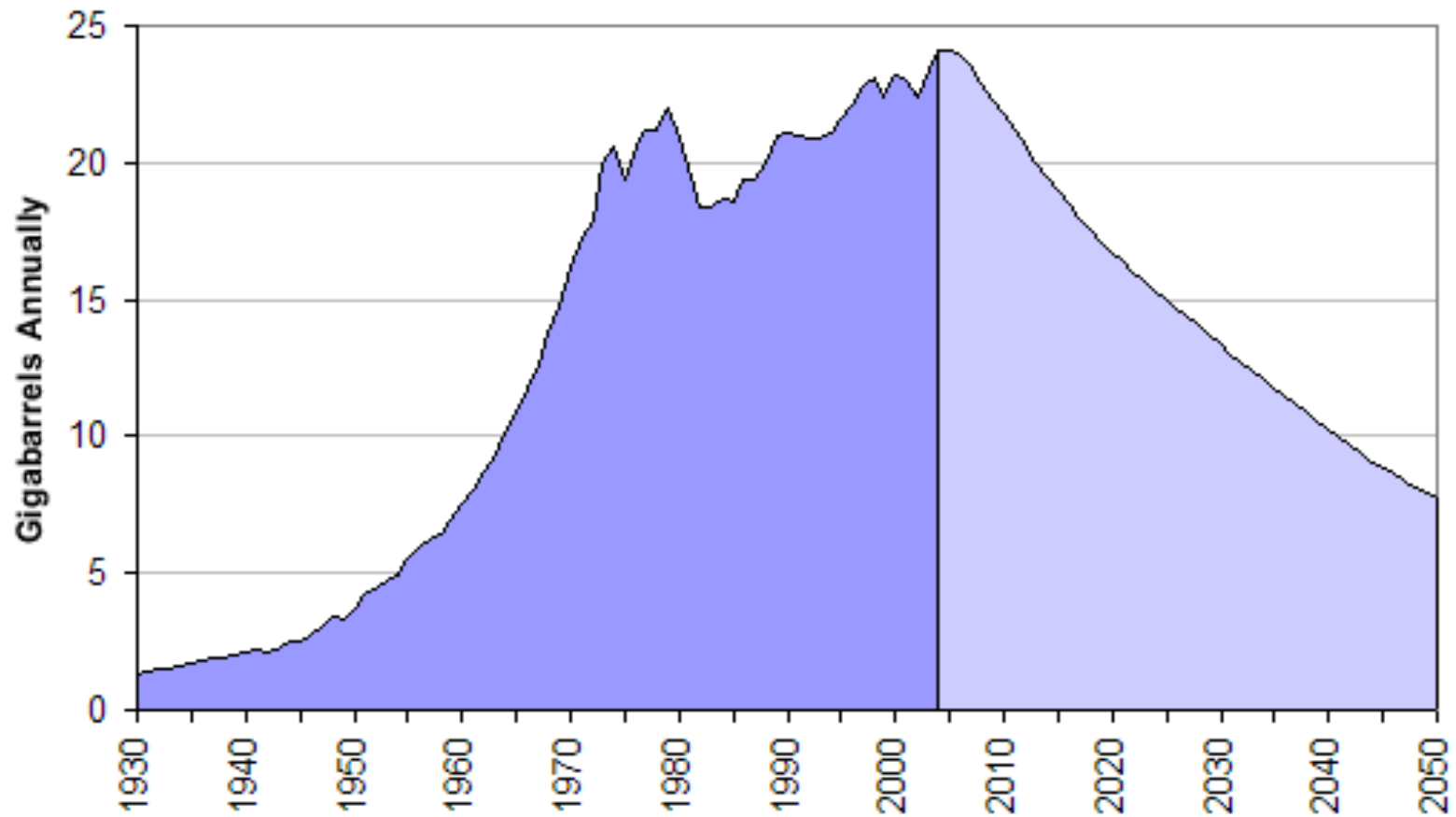


Solar Electric Sizing

- Load Analysis - Determine ADC (Average Daily Consumption)
- Site Analysis - Determine PSH (Peak Sun Hours)
- $ADC / PSH = PV \text{ Array Size}$
- Determine PV Make and Model
- De-rate PV module for real world application (.7 multiplier)
- Determine # of modules necessary to meet array size



World Oil Production



Public Incentives for Residential Solar Power

www.dsireusa.org

- Federal Tax Credit of 30%!
- Solar Multiplier Public Office PV Rebate Program \$2,000 / KW Grid Interactive Solar System
- MN Power Rebate up to \$4,750 / KW Grid Interactive Solar System
- Great River Energy no rebate
- Solar hardware is tax exempt
- Property Improvements are tax exempt
- Net Metering

**Database of State
Incentives for
Renewable Energy**