AMERICAN RIVER COLLEGE

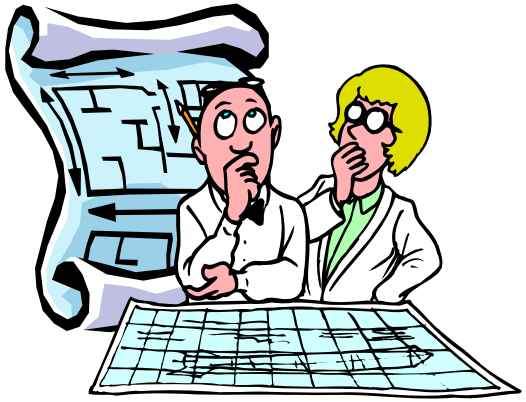
Site Assessment

Lesson Plan

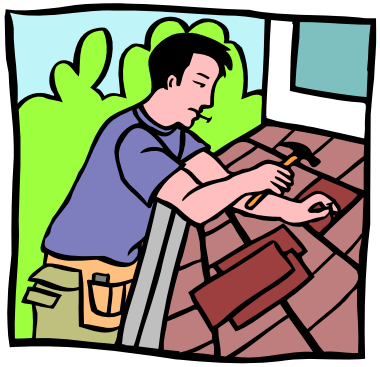
- Site Assessments Review

The PV Installation Process

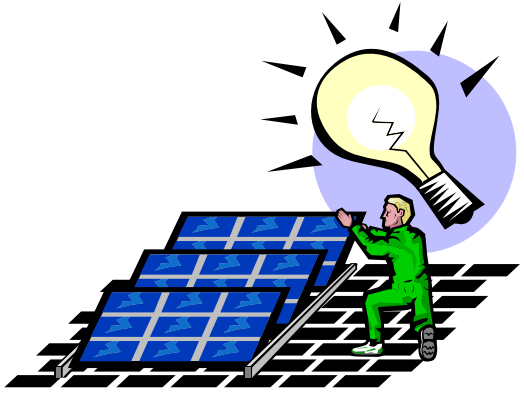
Conducting a Site Survey



Selecting a System



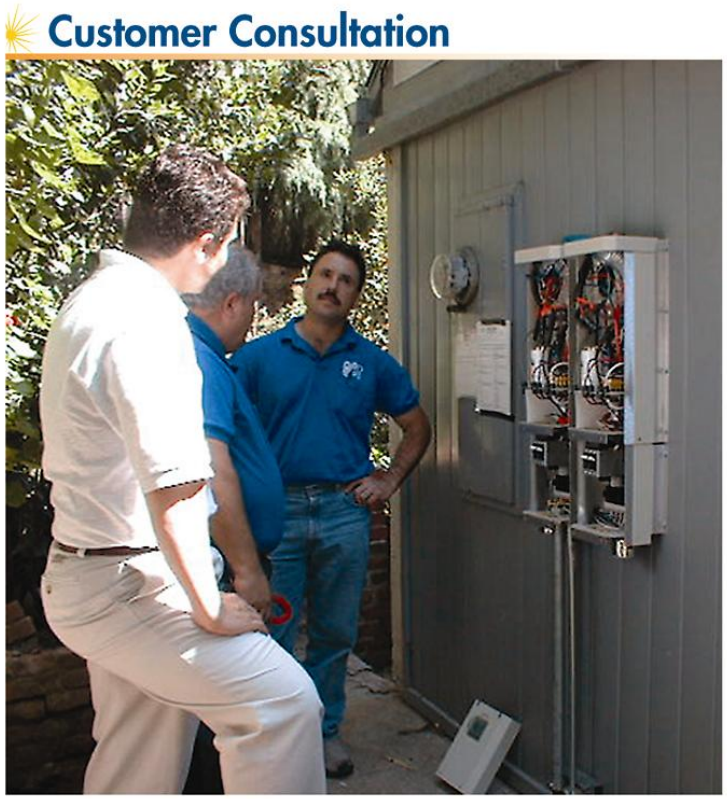
Installing the System



System Checkout & Inspection

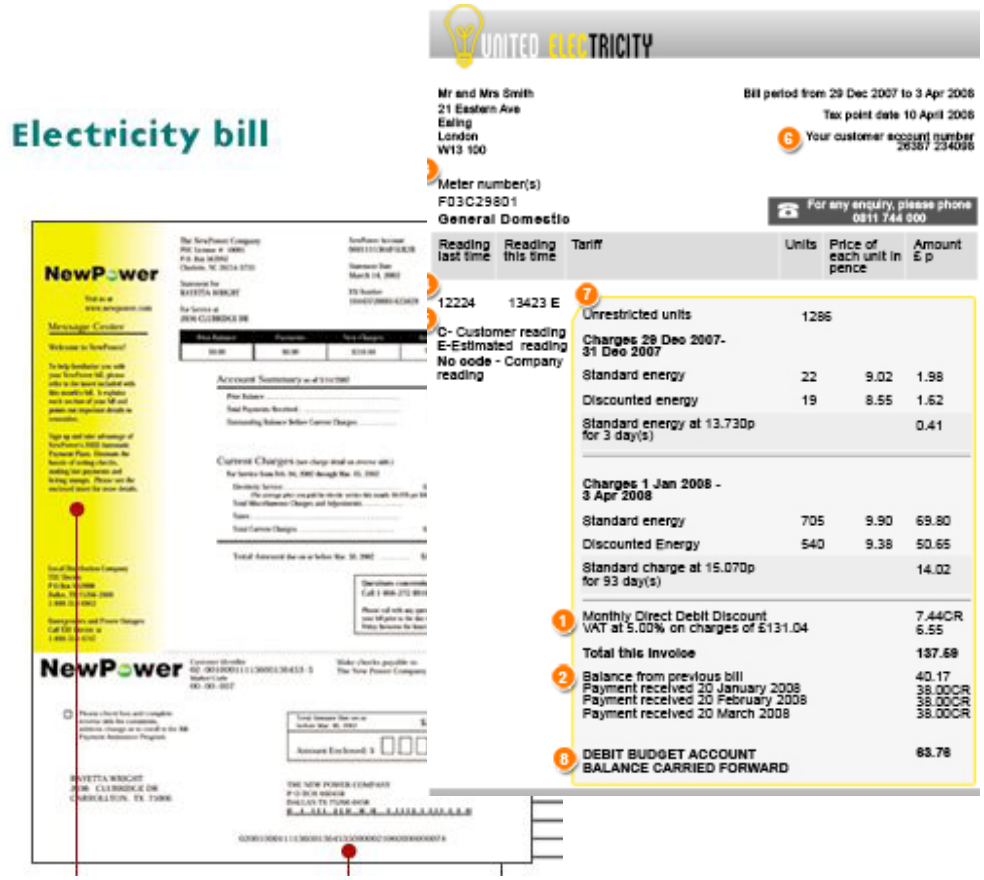
Sales, Site Assessment and Estimation

- The installer should meet with each customer to discuss available PV system options.
- Good public relations skills are essential.
- Monthly electricity use, conservation and energy efficiency should be an important part of the discussion.



SolarWorld Industries America

Yearly Electric Use History Averaged to kWh per day



Electricity bill

NewPower

UNITED ELECTRICITY

Mr and Mrs Smith
21 Eastern Ave
Ealing
London
W13 100

Bill period from 29 Dec 2007 to 3 Apr 2008
Tax point date 10 April 2008
6 Your customer account number 26387 234098

Meter number(s)
F03C29801
General Domestic

For any enquiry, please phone 0811 744 000

Reading last time	Reading this time	Tariff	Units	Price of each unit in pence	Amount £ p
12224	13423 E	7 Unrestricted units	1286		
		C- Customer reading E-Estimated reading No code - Company reading			
		Charges 29 Dec 2007-31 Dec 2007			
		Standard energy	22	9.02	1.98
		Discounted energy	19	8.55	1.62
		Standard energy at 13.730p for 3 day(s)			0.41
		Charges 1 Jan 2008 - 3 Apr 2008			
		Standard energy	705	9.90	69.80
		Discounted Energy	540	9.38	50.65
		Standard charge at 15.070p for 93 day(s)			14.02
		1 Monthly Direct Debit Discount VAT at 5.00% on charges of £131.04			7.44CR 6.55
		Total this invoice			**137.59**
		2 Balance from previous bill Payment received 20 January 2008 Payment received 20 February 2008 Payment received 20 March 2008			40.17 38.00CR 38.00CR 38.00CR
		8 DEBIT BUDGET ACCOUNT BALANCE CARRIED FORWARD			63.76

Using GPS For Initial Site Survey saves time and $$$

Zillow.com

ROOFRAY beta
what's your solar potential?

google earth

Phone Survey

- do you own or rent?
- what is your address?
- what is the square footage of your house?
- approximately when was your house built?
- how much is your average utility bill?
- what is your utility company?
- do you expect PV to provide all or part of your electricity?
- are there large trees in your yard?
- other shading issues, buildings, neighbors trees, etc.?
- how is your house oriented N,E,S,W?
- is your roof sloped or flat?
- what condition is your roof?

Site Evaluation Check List

- Utility bills, electricity usage history
- Energy Audit
  - Windows, doors, heat gain/loss
  - Appliances
  - Insulation, ducts, and pipes
- Orientation of structure
- Solar resource
- Shading
- Pitch of roof and available roof area
  - Plumbing vent pipes, skylights, chimney, sat dish
  - AHJ standoffs
- Type of roof material and condition of the roof
- Framing type, condition of framing and decking
- Electrical service, size, location

- Information gathered during a site survey should be carefully documented.
- Roof type and condition
- Roof pitch
- Orientation
- Shading issues
- Structural considerations
- Size & condition of existing
- Electrical service
- etc.

Site Survey

PV SYSTEM SITE SURVEY INFORMATION

GENERAL INFORMATION
Customer: Smith Residence
Site Address: 123 Main St., Anytown, IL 60123
Contact Name: John Smith, homeowner
Phone: 555-0123 Fax: 555-0124 Email:

Utility: Regional Power, Inc.
Contact Name: Beverly Jones
Phone: 555-6789 Fax: 555-6790 Email: jones@regionalpower.com

Permitting Authority: Village of Anytown
Contact Name: Gary Roberts, building inspector
Phone: 555-5215 Fax: 555-5235 Email: roberts@anytown.vil.us

Type of System Desired: Utility-interactive Output (kW): 5.0
Critical Loads (W): N/A Autonomy (days): N/A

SOLAR RESOURCE & WEATHER
Latitude: 41°N Longitude: 87°W Basic Wind Speed (mph): 90
Insolation (kW/m²) AVG: 3.9 MAX: 6.3 MIN: 1.5
Temperatures (°F) AVG: 50 MAX: 105 MIN: -20
Potential for Extreme Weather: Heavy thunderstorms, heavy snowfall

PROPOSED ARRAY LOCATION
Area (ft²): 1000 Slope (°): 33° Azimuth Orientation (°): 210° (SSW) Height (ft): 10-25
Accessibility: requires extension ladder or aerial lift, fall protection
Shading Analysis Results: tree will shade location from 9 AM to 11 AM November through January

ROOFING
Type of Roofing: Asphalt shingle Age (yrs): 10 Thickness ("): 1.25
Surface Condition: good, no repairs needed
Type of Supporting Structure: 2 × 6 rafters 12" O.C.
Structural Concerns: none

ELECTRICAL SYSTEM
Primary Service: 120/240 V, 1ϕ, 200 A Source: Overhead from utility pole
Other Sources: none
Ratings: 200 A main breaker
Annual Electricity Use (kWh): 10,900 Rate (¢/kWh): 8.6
Point of Connection: Main service panel
Proposed Inverter Location: Basement Accessibility: good
Proposed Battery Location: N/A Accessibility: N/A
Proposed Disconnect Locations: Basement, exterior wall Accessibility: both good
Electrical Concerns: none

Other Comments or Issues: Customer wants to be able to easily upgrade and/or expand system in future. Possibilities include larger array and battery backup system.

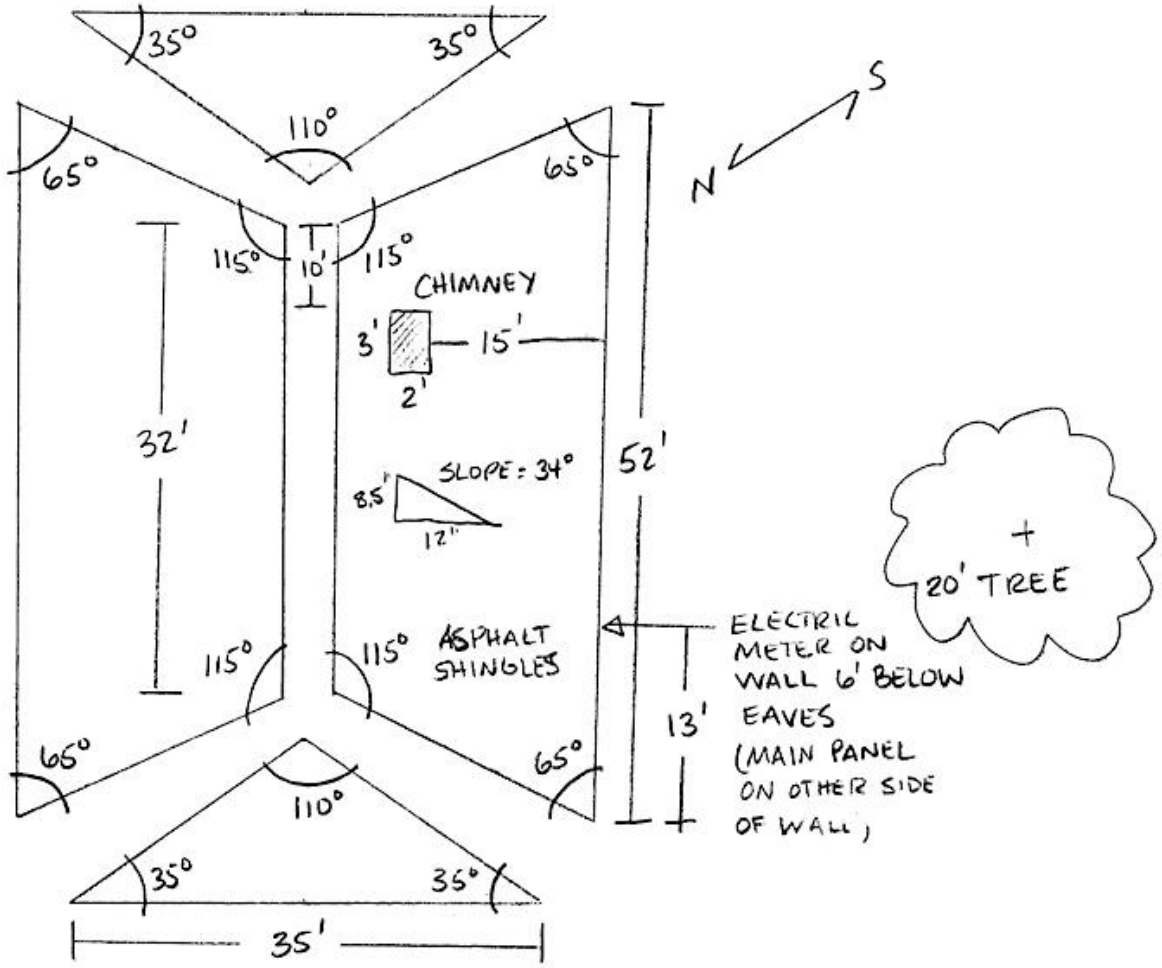
Surveyor: Jane Miller Date: 7/12
Signature: J. Miller

Load Analysis

AC Load	Quantity		Power Rating (W)		Average Daily Use (hrs/day)		Average Daily Energy Use (Wh/day)
Incandescent Lighting	6	x	60	x	6	=	2160
Refrigerator	1	x	475	x	12	=	5700
Microwave	1	x	1200	x	0.5	=	600
Toaster	1	x	1200	x	0.15	=	180
Dishwasher	1	x	1500	x	0.5	=	750
Furnace Fan	1	x	500	x	2	=	1000
TV	1	x	130	x	3.5	=	455
VCR	1	x	40	x	0.75	=	30
Ceiling Fans	3	x	50		6		900

A load analysis is part of an energy audit, which is used to evaluate a customer's energy use for system sizing.

Site Layout Drawing



A site layout drawing shows basic building dimensions and locations of major components.

Gizmos & Gadgets Of The Trade

Sol Metric Suneye

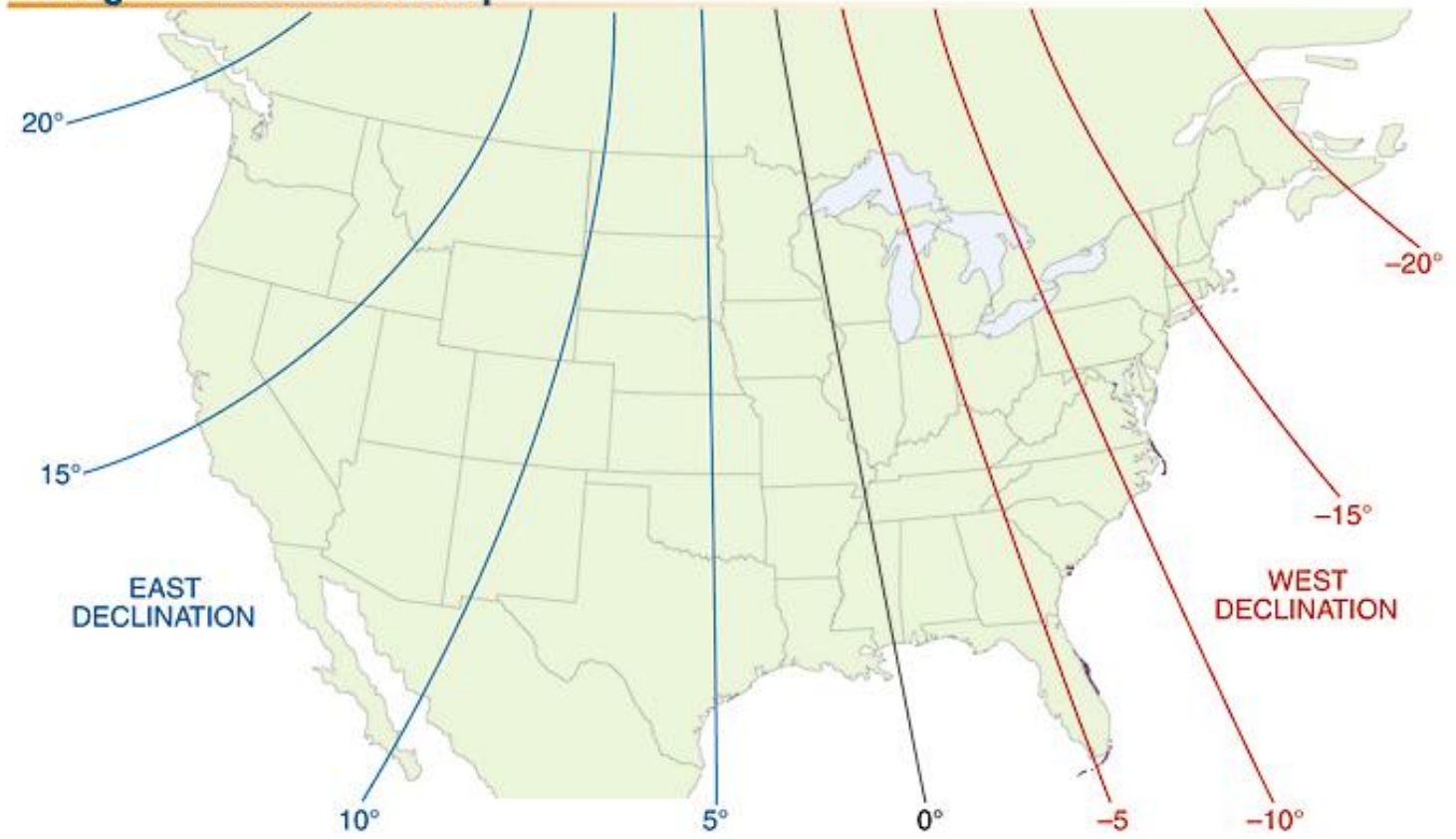
Deep Framing Detector

Roof Angle Finder

Irradiance Meter

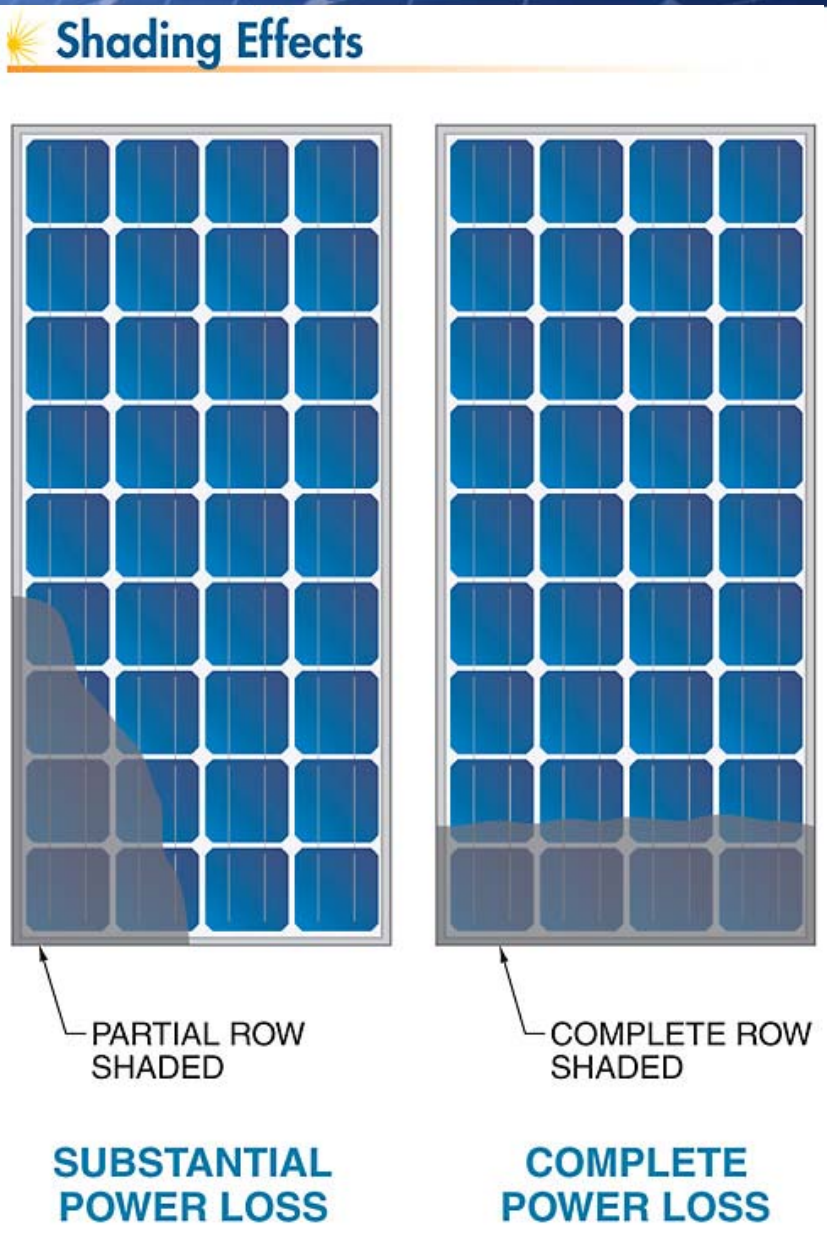
Solar Path Finder

Magnetic Declination Map

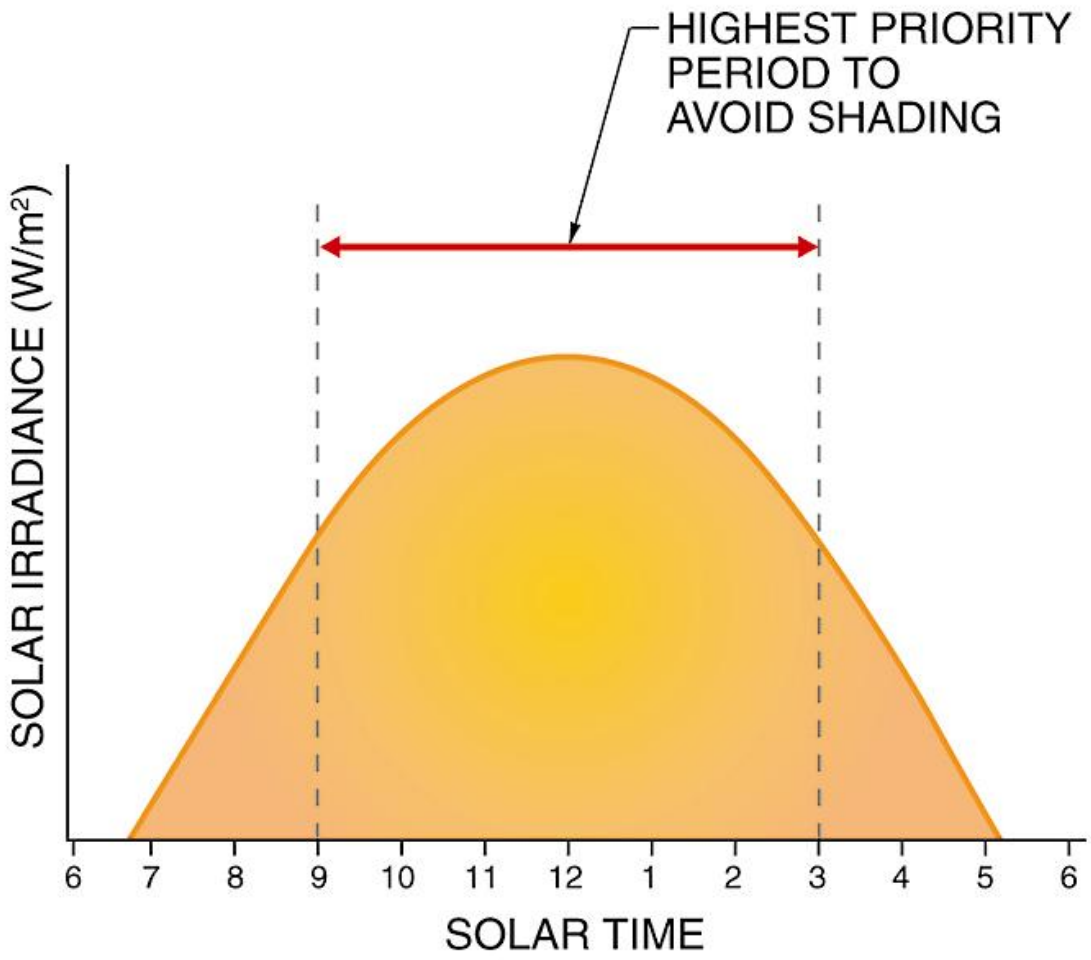


Magnetic declination varies by location and changes slightly over time. Up-to-date maps are used to determine the necessary declination adjustment.

Shading of PV modules and arrays can cause disproportional reductions in power output.



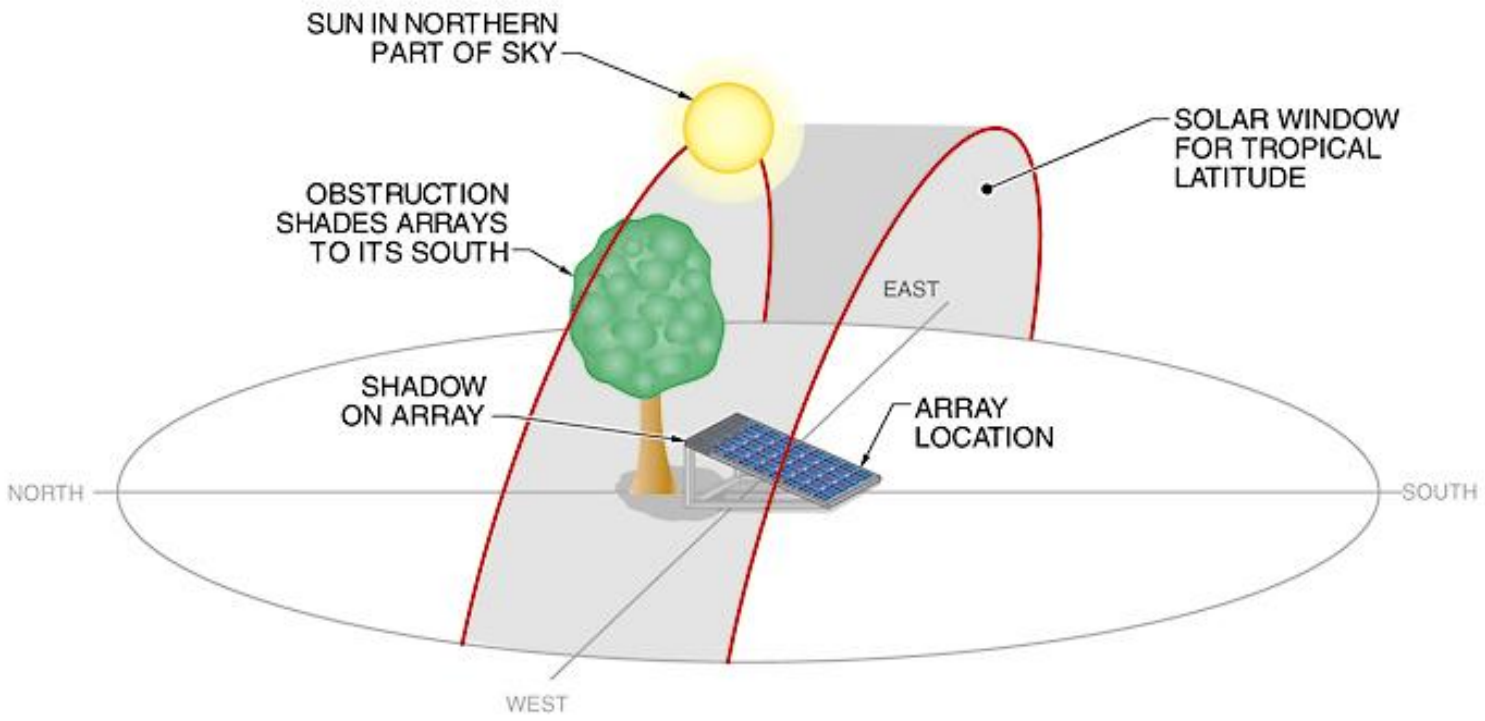
Shading Priority



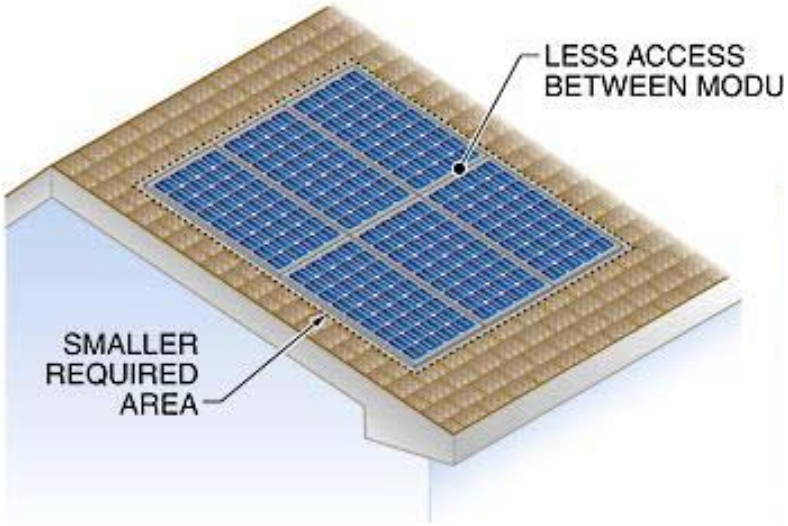
Most of the daily solar radiation occurs between 9 AM and 3 PM, so avoiding shading during this period is high priority.

When the sun is in the northern part of the sky, shading can be caused by obstructions immediately north of an array.

Shading from the North



Array Area Requirements



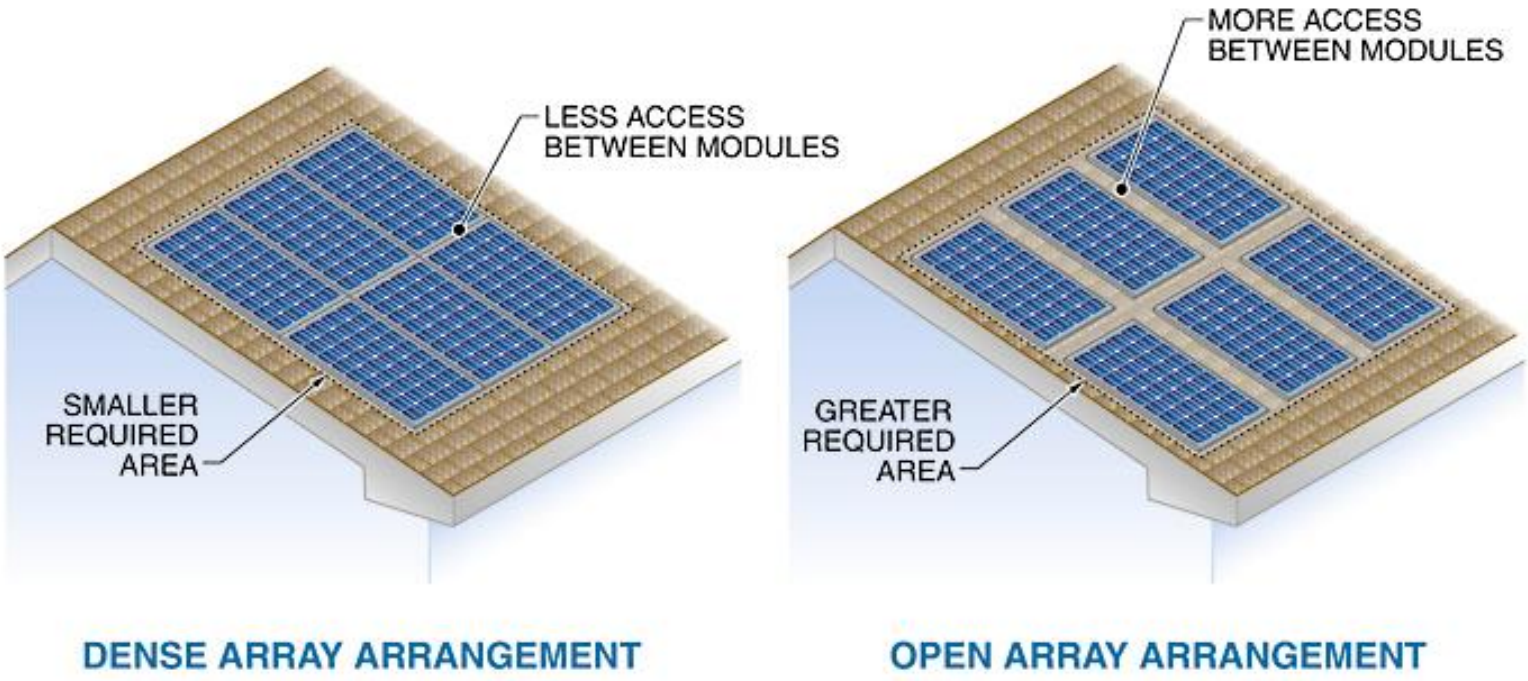
DENSE ARRAY ARRANGEMENT

- Length x width = Area
- Area x 15W = apprx power availability
- Only an approximation
- Not a substitute for PV sizing!
- Does not adjust for orientation, tilt, shade, etc

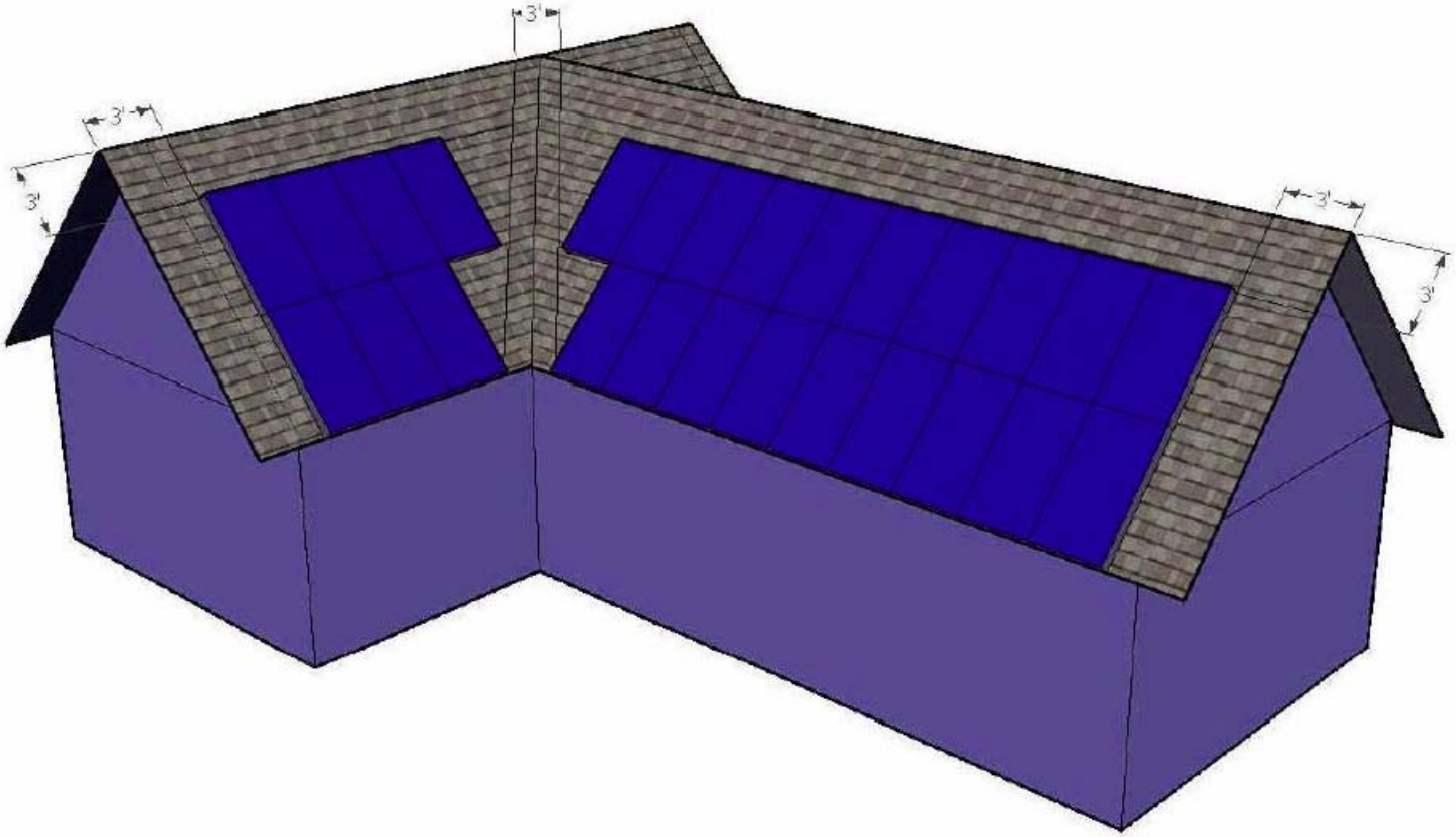
Overall output is based on solar resource, shading, module efficiency, etc. but there is a good site survey rule of thumb:

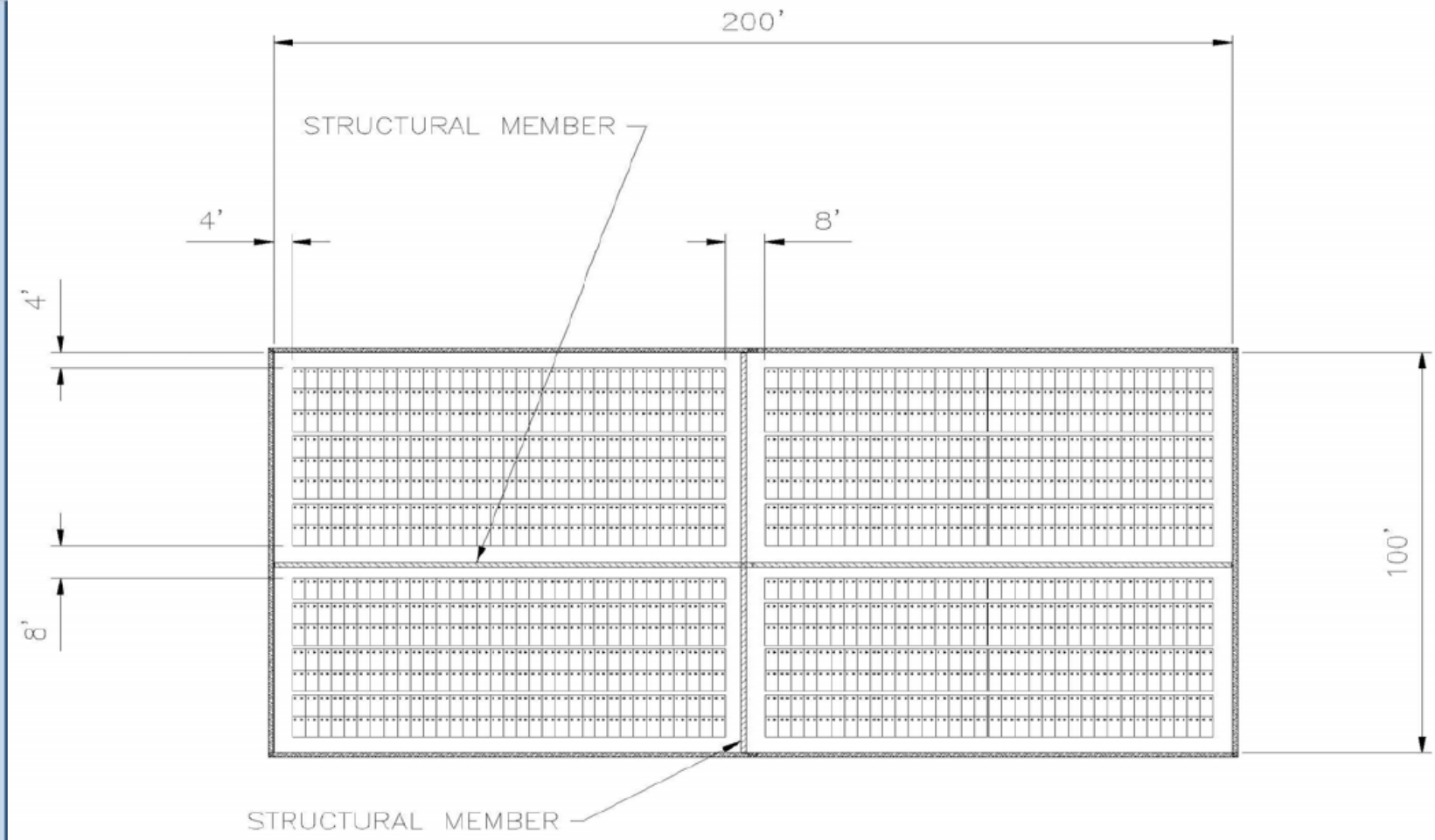
15W per square foot of available area

Array Area Requirements



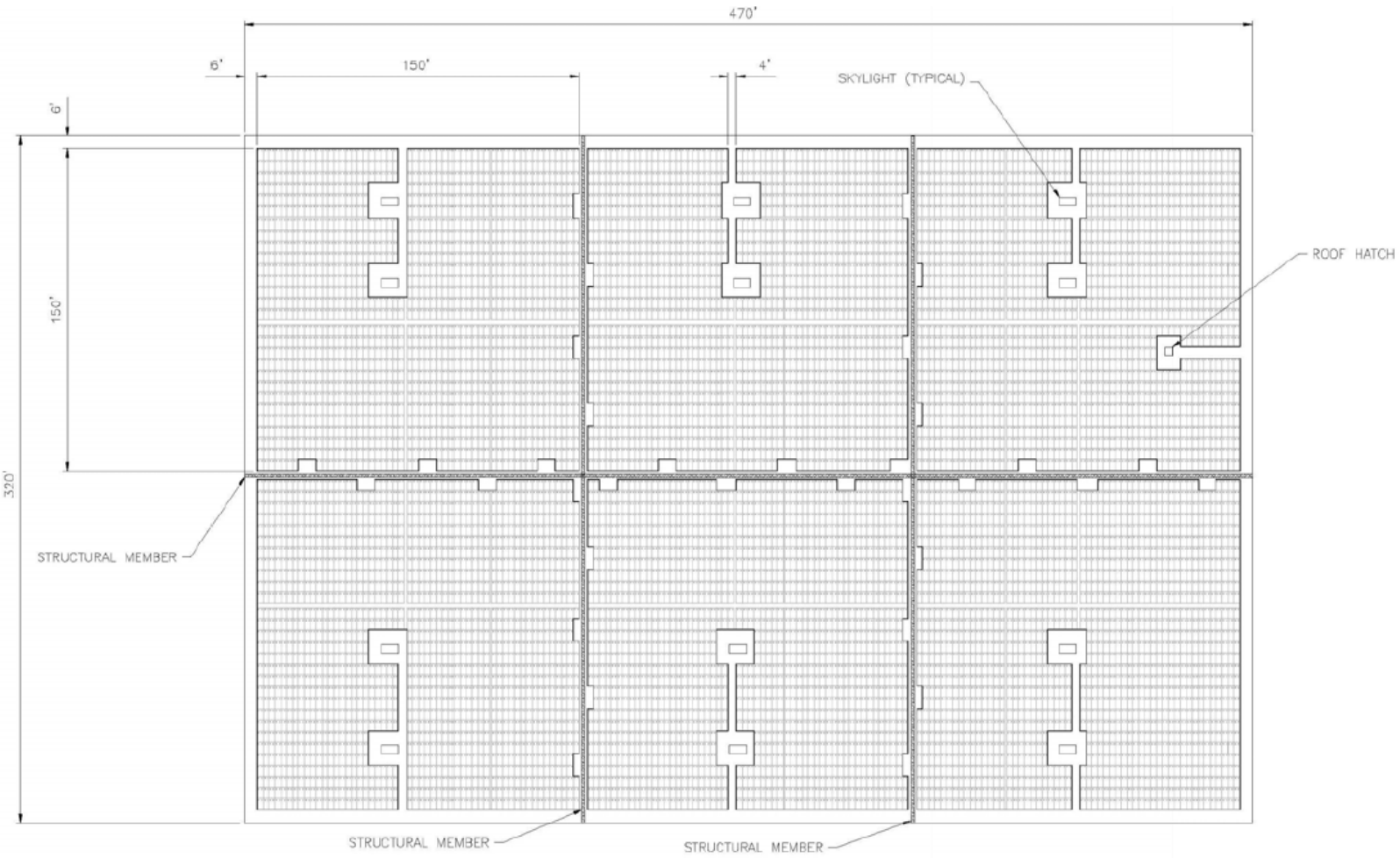
The density of the module arrangement in an array affects the accessibility and the area required to produce a certain amount of power.





SOLAR ARRAY EXAMPLE – SMALL COMMERCIAL

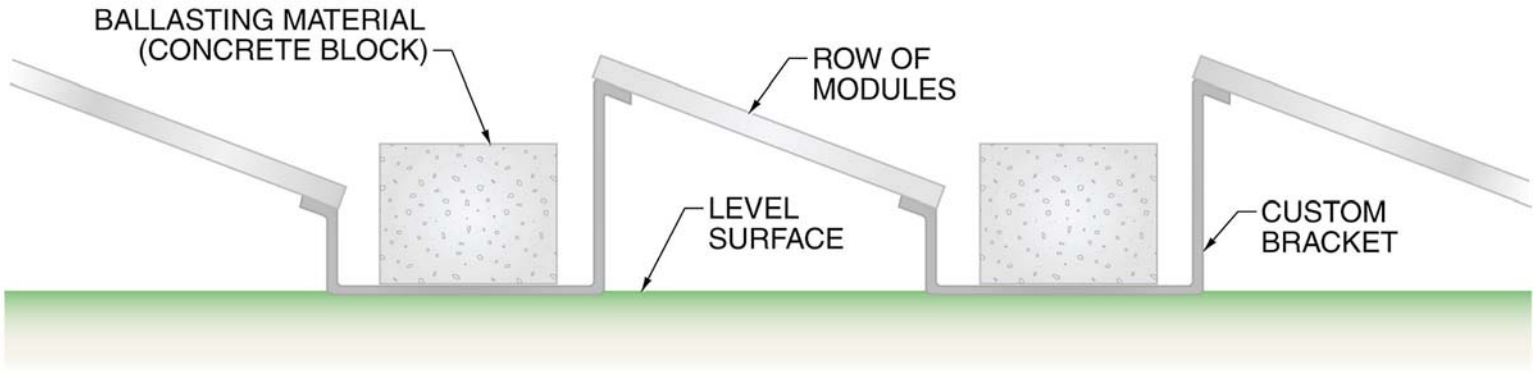
8' WALKWAYS



SOLAR ARRAY EXAMPLE – LARGE COMMERCIAL

4' WALKWAYS WITH 8' X 4' VENTING OPPORTUNITIES EVERY 20'

Self-Ballasting



Fixed-tilted arrays require additional space considerations.

Why does it matter?

How do we calculate? (math……)