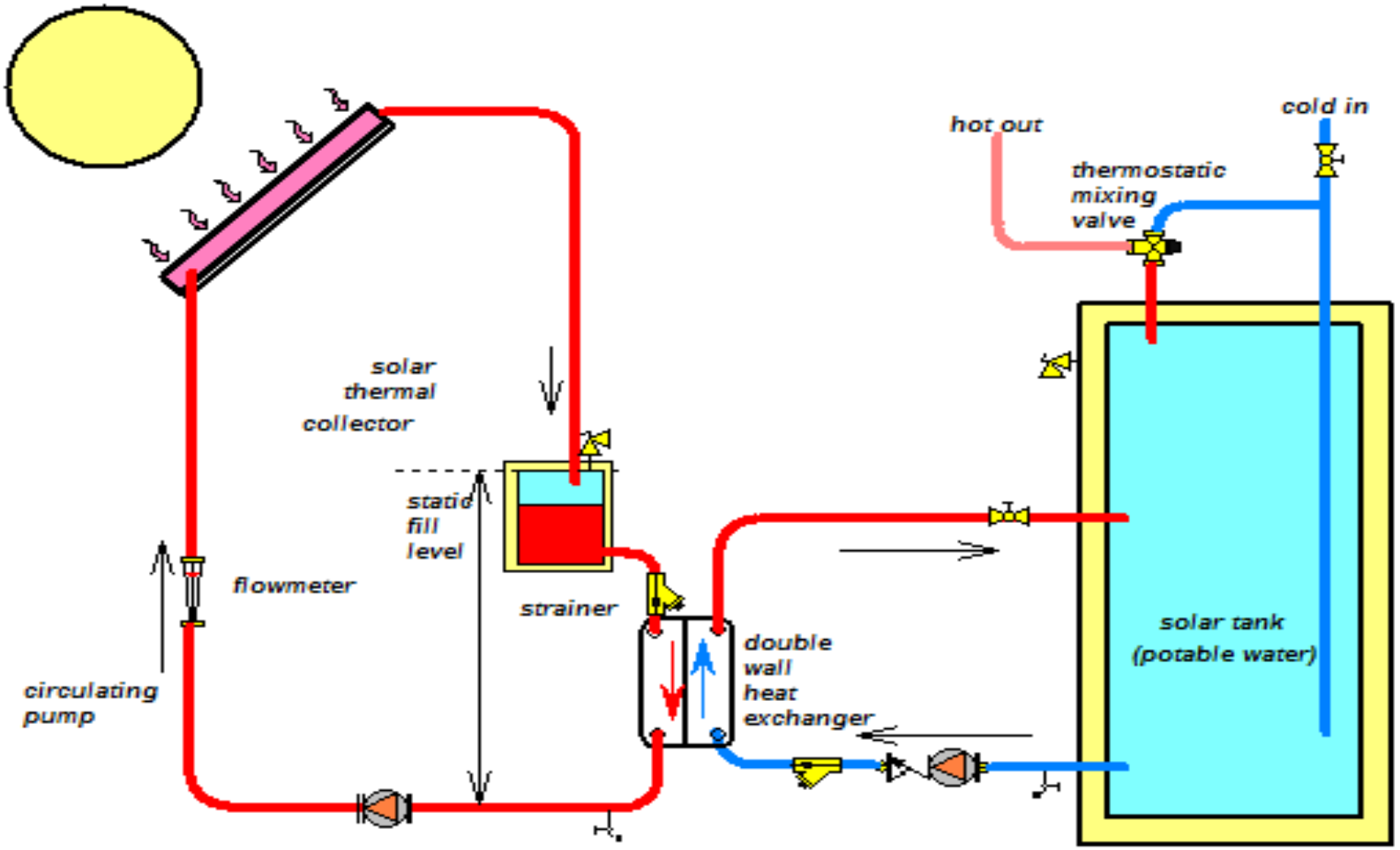
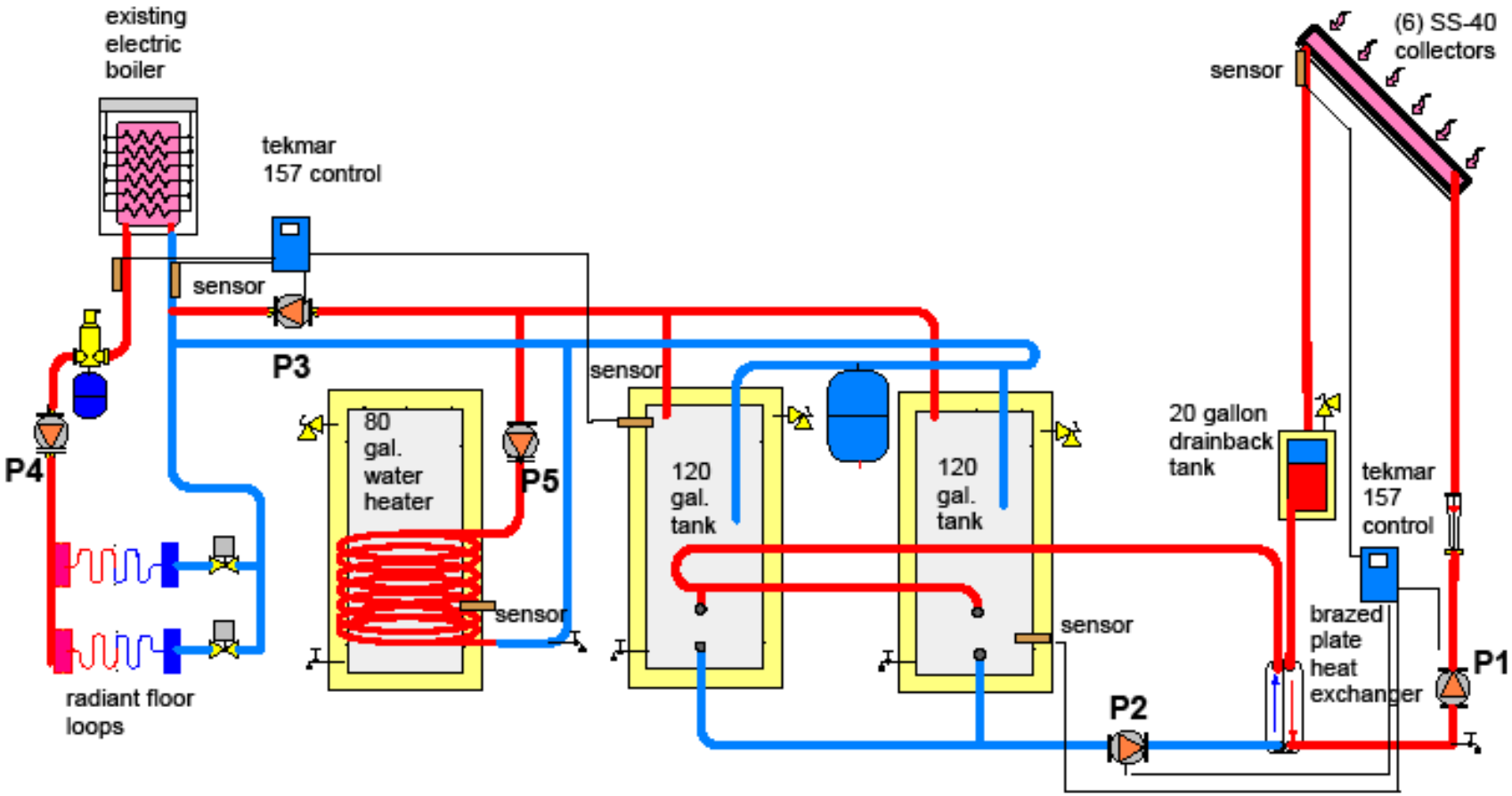
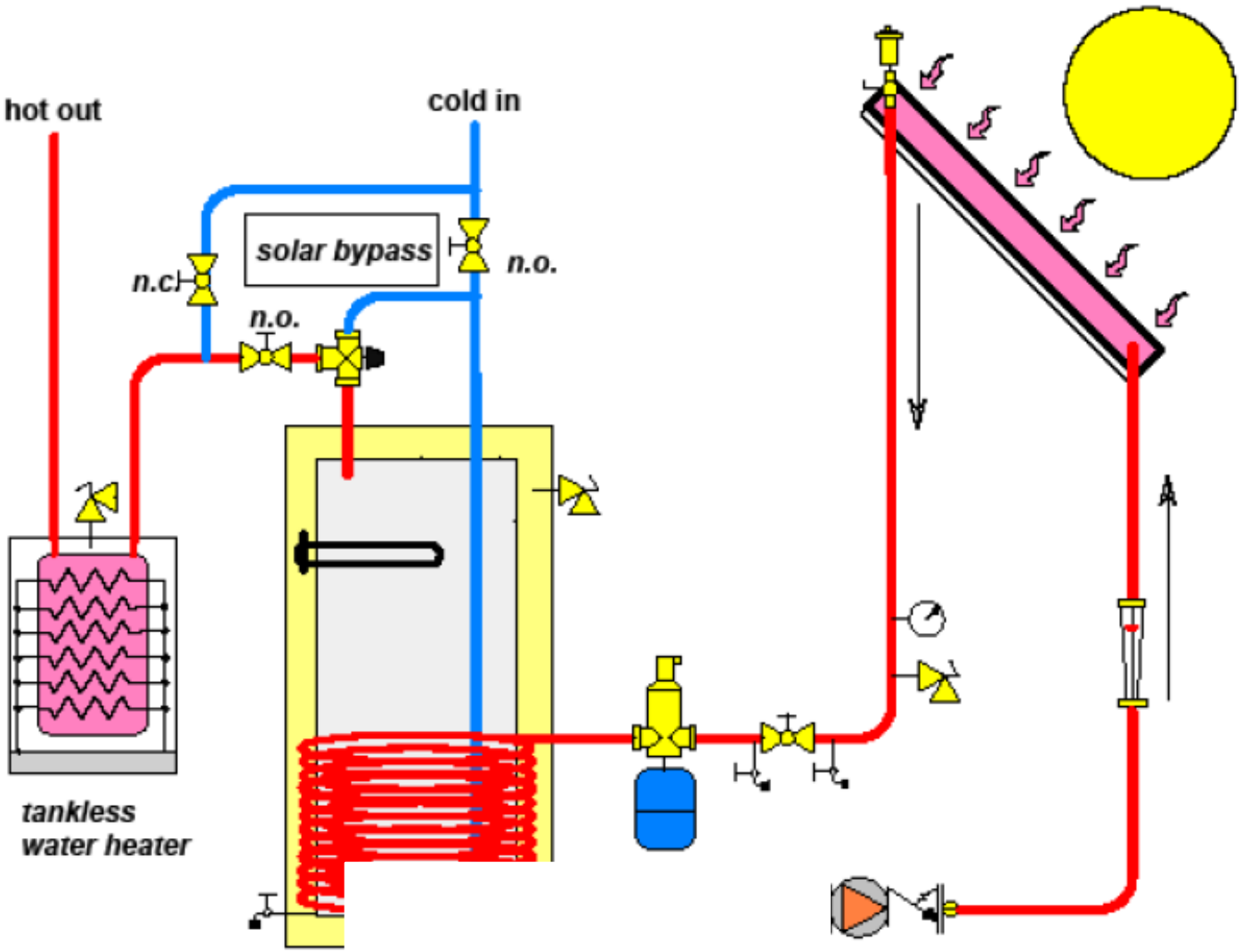
DRAINBACK CLOSED LOOP SYSTEM



DRAINBACK HEAT and DOMESTIC HOT WATER



SOLAR TANK W/ WRAP AROUND HEAT EXCHANGER PRESSURIZED SYSTEM



Solar Heat Sizing

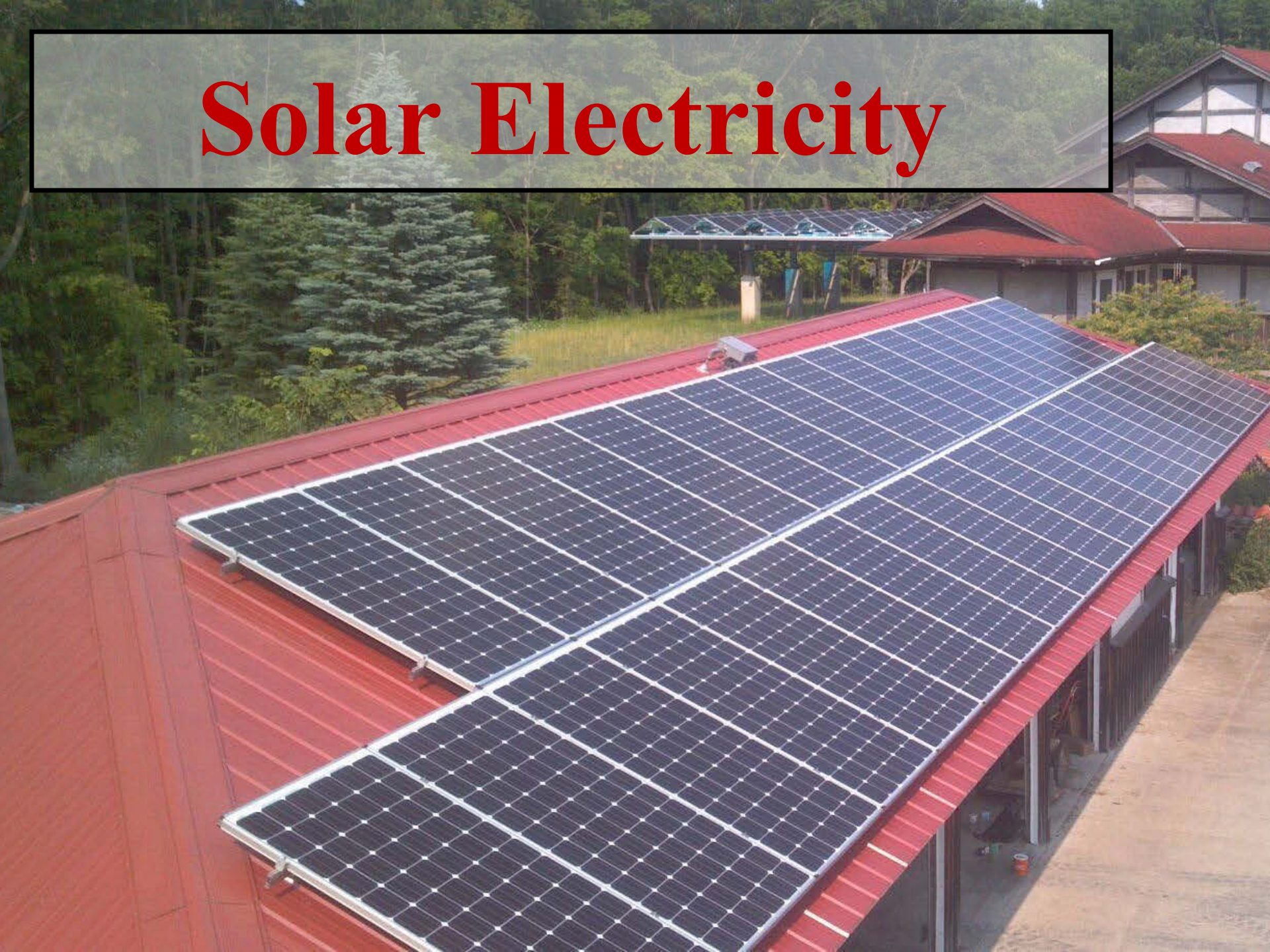
Method 1

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

Method 2

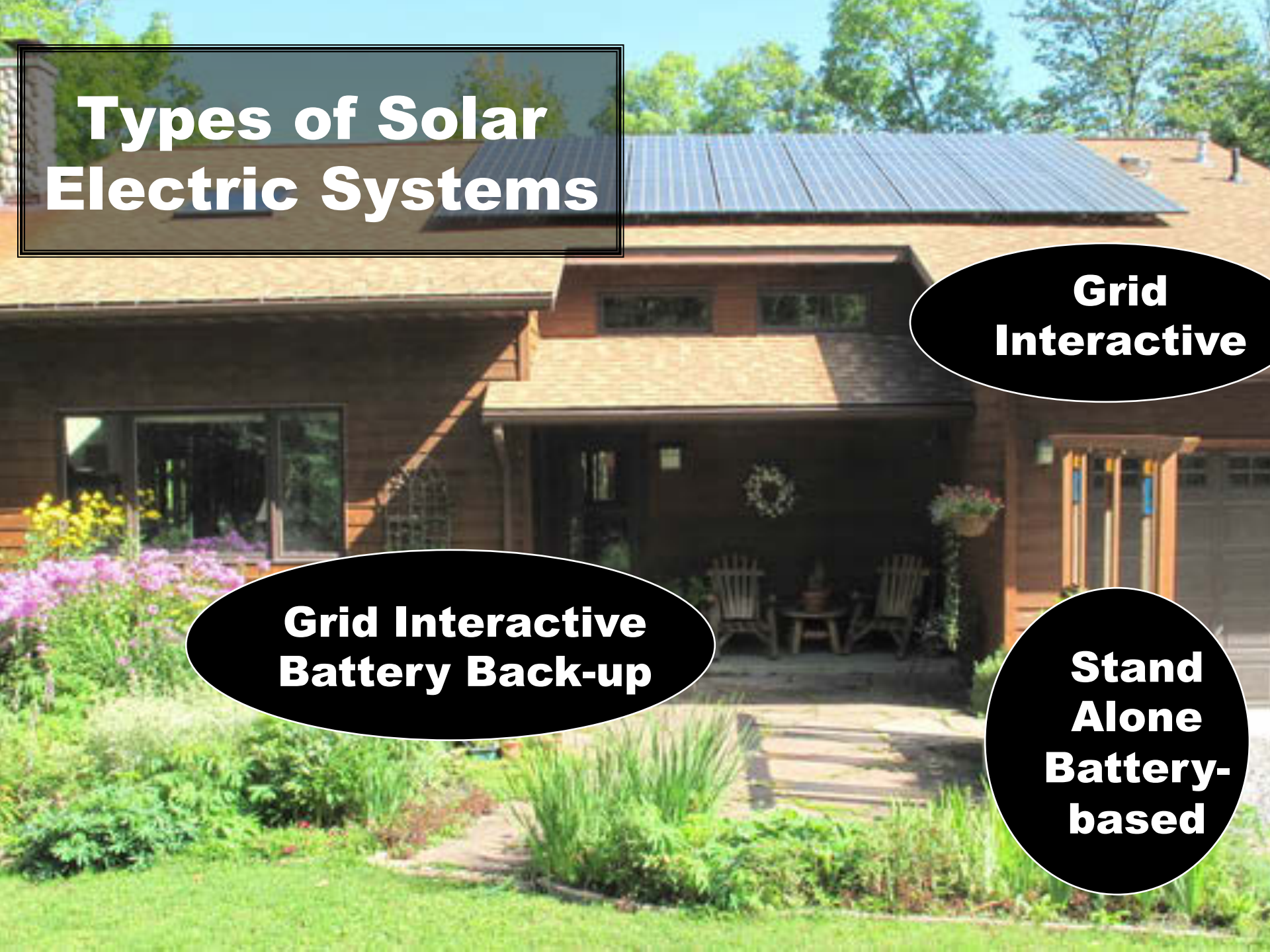
- Load Analysis
- (Wc) (Ts-Ti) (Cp) 8.33
- (65) (70) (1 BTU/lb. F) 8.33 = 37901.5 btus
- Array Sizing
- PSH (4.3) / 10.76 = .399 kWh / sq. ft. / day
- .399 x 3413 = 1361 BTUs / sq. ft. / day
- Match with thermal collector rating

Solar Electricity



Types of PV Modules

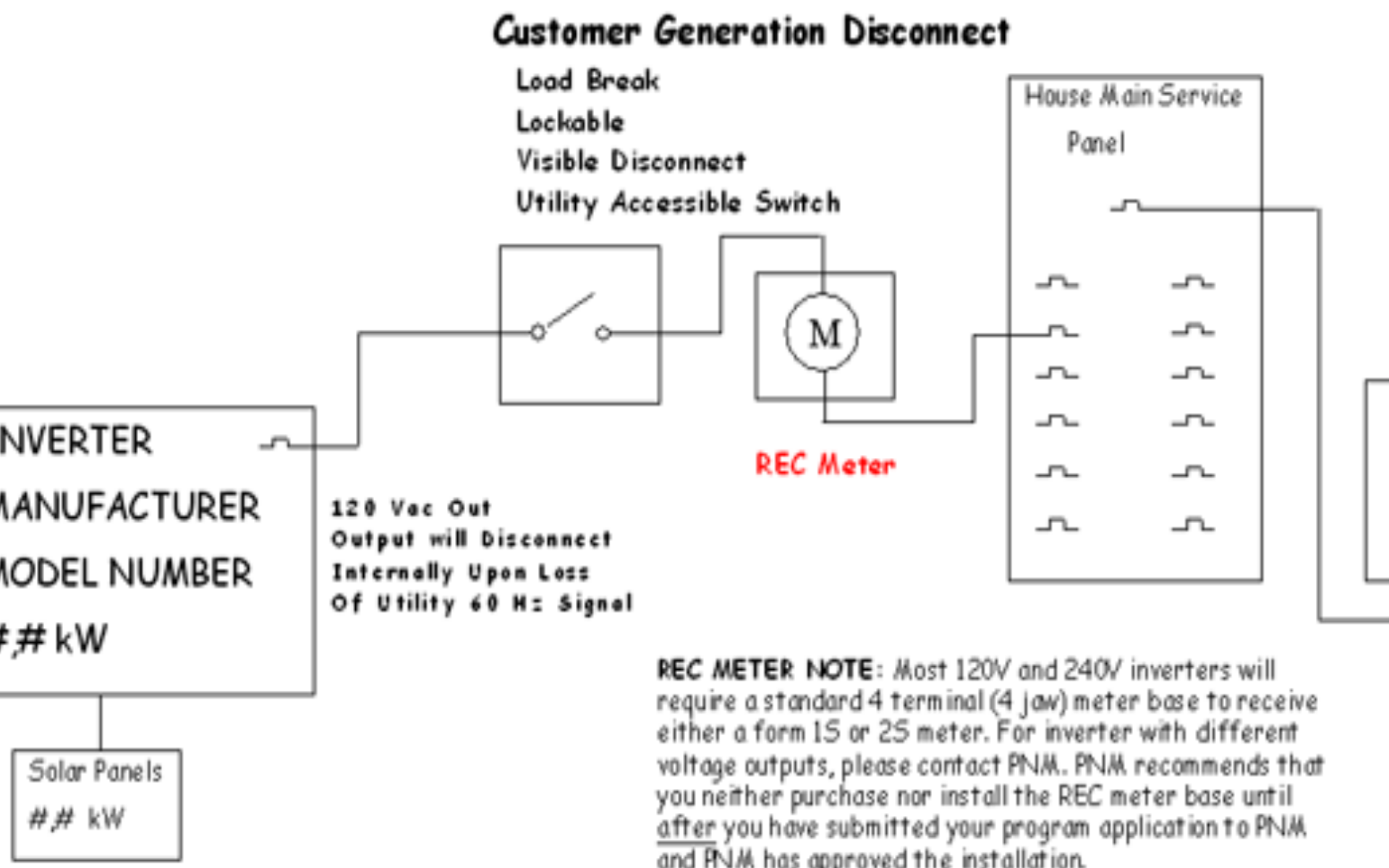
1. Mono-crystalline Si
2. Poly-crystalline Si
3. Amorphous Si
4. CIGS
5. CdTe


Types of Solar Electric Systems
Grid Interactive
Grid Interactive Battery Back-up
Stand Alone Battery-based

Grid-Interactive Solar Electric System

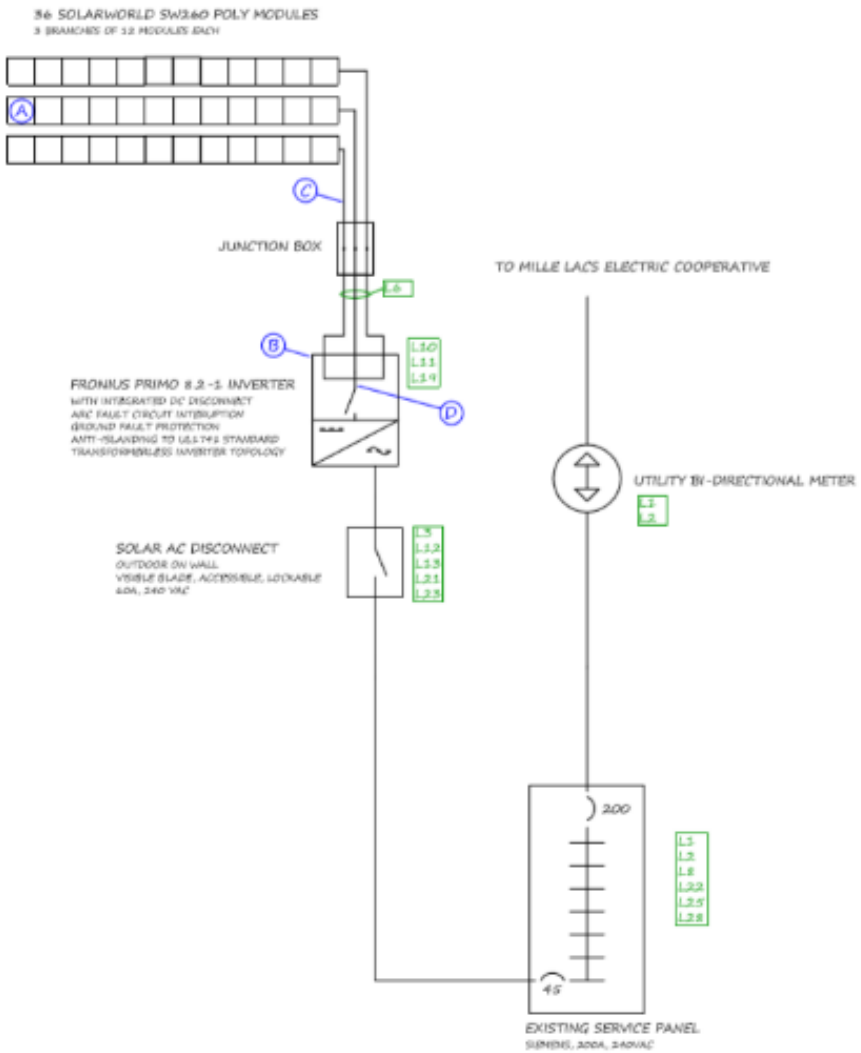
- Rebates
- Battery Free
- Flexible budgeting

SAMPLE ONE-LINE DIAGRAM: GRID-TIED SYSTEM



REC METER NOTE: Most 120V and 240V inverters will require a standard 4 terminal (4 jaw) meter base to receive either a form 1S or 2S meter. For inverter with different voltage outputs, please contact PNM. PNM recommends that you neither purchase nor install the REC meter base until after you have submitted your program application to PNM and PNM has approved the installation.

ONE LINE DIAGRAM



NOTE:

- GROUND WIRE NOT SHOWN
- SEE SHEET L.1 FOR LIST OF NEC AND UTILITY REQUIRED LABELS
- NOT ALL EXISTING ELECTRICAL EQUIPMENT SHOWN

NEW EQUIPMENT

36 - 260W SOLARWORLD SW260POLY PHOTOVOLTAIC MODULES

SPECIFICATIONS

(A) MODULE

SOLARWORLD SW360POLY 260W	Pmax	RATED	260 W
	Vmp	NAMEPLATE	31.4 VDC
	Imp	NAMEPLATE	8.37 A
	Voc @ -40C	CALCULATED	46.14 VDC
	Isc	NAMEPLATE	8.94 A

-DC VOLTAGE MAY BE PRESENT WHEN SOLAR MODULES ARE EXPOSED TO SUNLIGHT

(B) INVERTER

FRONIUS PRIMO 8.2-1 5.0 KW	WATTS, RATED	NOMINAL	8200 W
	OUTPUT VOLTAGE	NOMINAL	240 VAC
	OUTPUT CURRENT	MAX	34.2 A
	MAX EFFECIENCY	RATED	97.0%

-INVERTER IS UL1741 LISTED
-INVERTER HAS BUILT IN AFCI PER UL1998

(C) STRING

	Pmax	RATED	3120 W
	Vmp	NAMEPLATE	376.8 VDC
	Imp	NAMEPLATE	8.37 A
	Voc @ -40C	CALCULATED	553.7 VDC
	Isc	NAMEPLATE	8.94 A

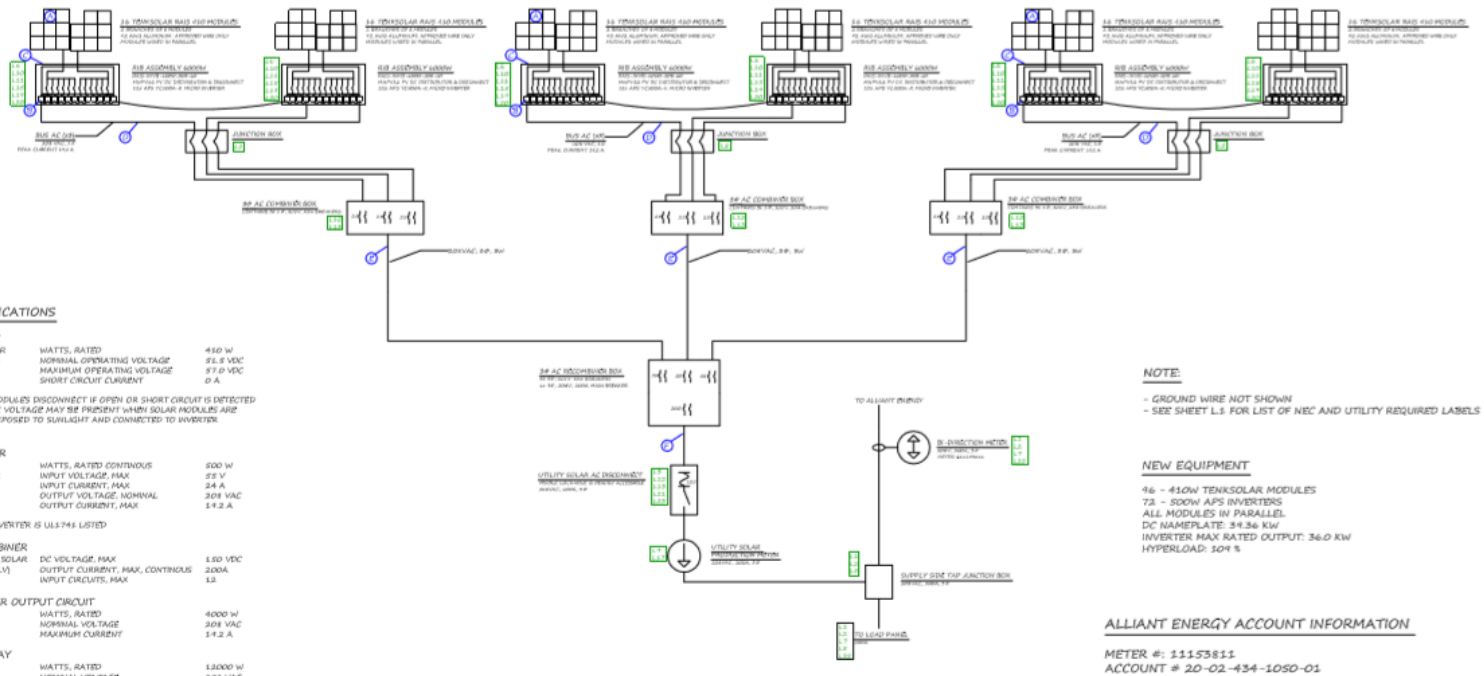
(D) ARRAY

PROJECT FOR: GRID-TIE, BATTERY FREE

REVISION SCHEDULE | BY | DATE | REV.

ELECTRIAL ONE LINE DIAGRAM

ONE LINE DRAWING



SPECIFICATIONS

(A) MODULE

TENKSOLAR RAIS XT-A 410W	WATTS, RATED	410 W
	NOMINAL OPERATING VOLTAGE	31.5 VDC
	MAXIMUM OPERATING VOLTAGE	37.0 VDC
	SHORT CIRCUIT CURRENT	0 A

-MODULES DISCONNECT IF OPEN OR SHORT CIRCUIT IS DETECTED
-DC VOLTAGE MAY BE PRESENT WHEN SOLAR MODULES ARE EXPOSED TO SUNLIGHT AND CONNECTED TO INVERTER

(B) INVERTER

APS YC500A-K 500W	WATTS, RATED CONTINOUS	500 W
	INPUT VOLTAGE, MAX	55 V
	INPUT CURRENT, MAX	24 A
	OUTPUT VOLTAGE, NOMINAL	208 VAC
	OUTPUT CURRENT, MAX	14.2 A

-INVERTER IS UL1741 LISTED

(C) DC COMBINER

MIDNIGHT SOLAR MNPV3.2 (LV)	DC VOLTAGE, MAX	150 VDC
	OUTPUT CURRENT, MAX, CONTINOUS	200A
	INPUT CIRCUITS, MAX	12

(D) INVERTER OUTPUT CIRCUIT

WATTS, RATED	4000 W
NOMINAL VOLTAGE	208 VAC
MAXIMUM CURRENT	14.2 A

(E) SUBARRAY

WATTS, RATED	12000 W
NOMINAL VOLTAGE	208 VAC
LINE CURRENT	33.3 A

(F) ARRAY

WATTS, RATED	36000 W
NOMINAL VOLTAGE	208 VAC
LINE CURRENT	47.8 A

NOTE:

- GROUND WIRE NOT SHOWN
- SEE SHEET L1 FOR LIST OF NEC AND UTILITY REQUIRED LABELS

NEW EQUIPMENT

96 - 410W TENKSOLAR MODULES
72 - 500W APS INVERTERS
ALL MODULES IN PARALLEL
DC NAMEPLATE: 39.36 KW
INVERTER MAX RATED OUTPUT: 36.0 KW
HYPERLOAD: 109 %

ALLIANT ENERGY ACCOUNT INFORMATION

METER #: 11153811
ACCOUNT # 20-02-434-1050-01

PROJECT FOR:
GRID-TIE, BATTERY FREE PV INSTALLATION
ALBERT LEA SEED HOUSE
1414 WEST MAIN STREET
ALBERT LEA, MN 56007

REV△	DATE	REVISION SCHEDULE	BY

REALSOLAR Solar Design-Build
WWW.REALSOLAR.ORG 218-397-4793 INFO@REALSOLAR.ORG

DRAWING BY: RSO
DRAWN BY: JDL
DATE: 3/6/15
SCALE: NTS

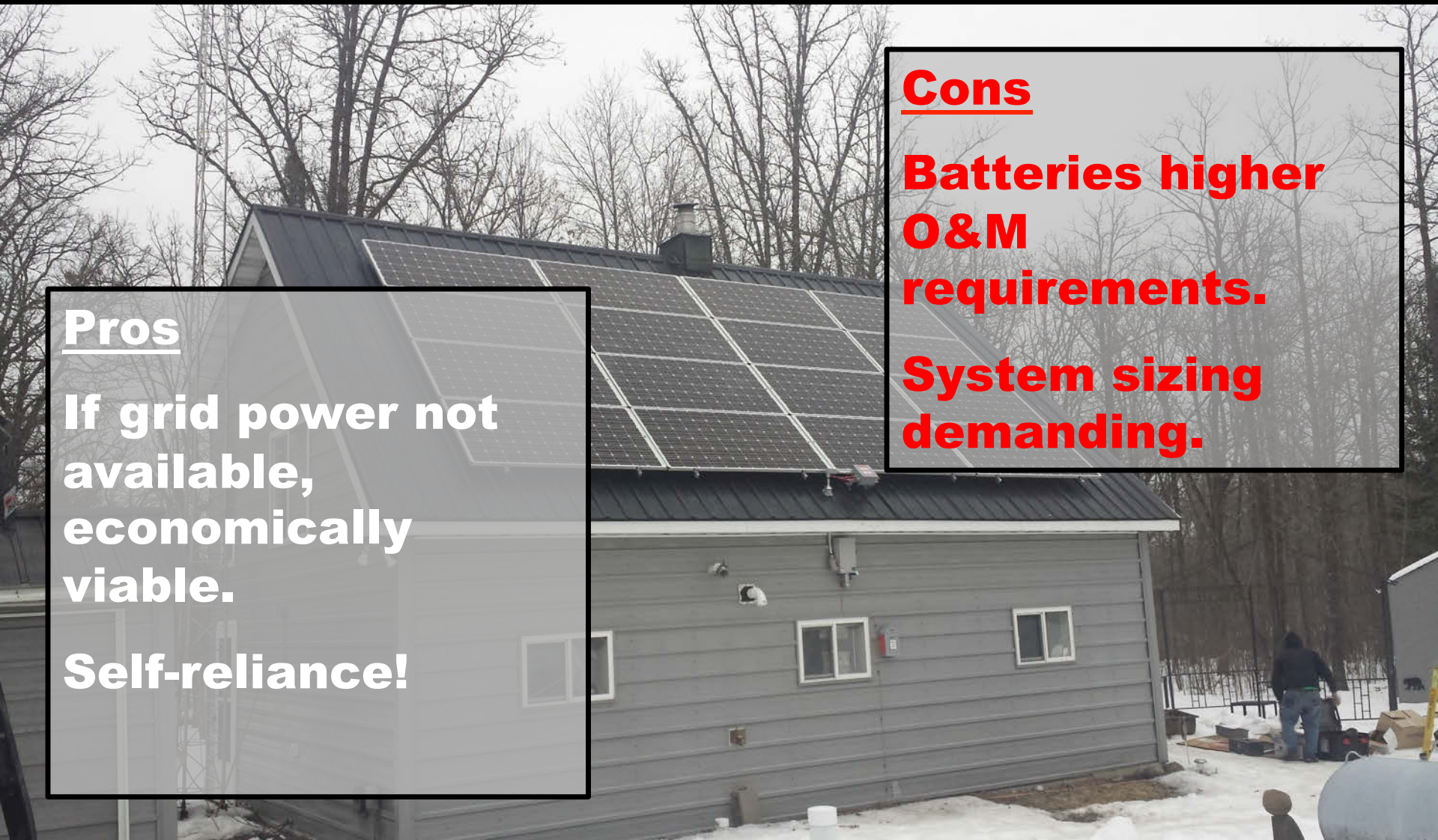
SHEET TITLE:
ELECTRIAL ONE LINE DIAGRAM

PROJECT NUMBER:
GTBF-39360

SHEET NUMBER:
E.1


If the grid goes down,
so do you!

Stand-alone Battery- Based System



Pros

If grid power not available, economically viable.

Self-reliance!

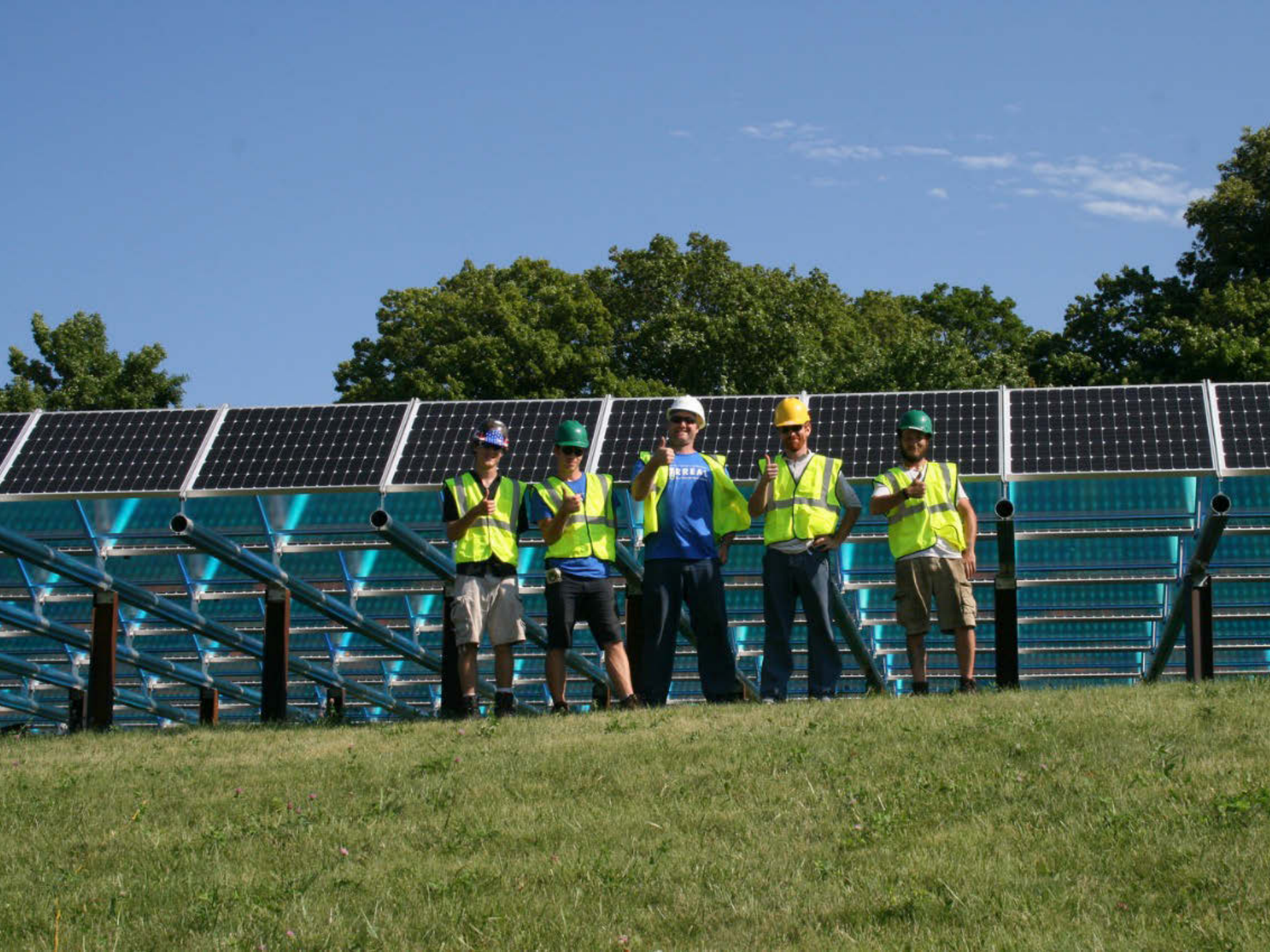
Cons

Batteries higher O&M requirements.

System sizing demanding.


Reality Check:
Flush Mount and Snow


1
2
3
4
5
6




Royalton
City on the Platte River
Pine Country Bank

Solar Electric Sizing

- Load Analysis - Determine ADC (Average Daily Consumption)
- Site Analysis - Determine PSH (Peak Sun Hours)
- ADC / PSH = PV 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

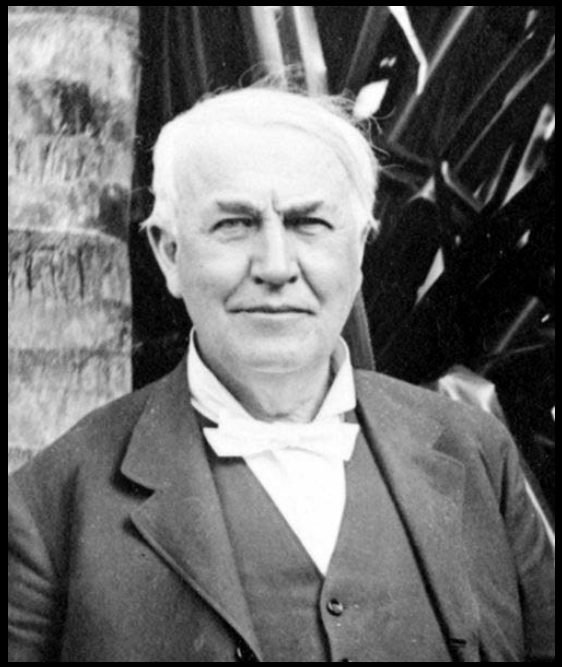
Incentives for Solar

http://mn.gov/commerce/energy/topics/resources/energy-legislation-initiatives/made-in-minnesota/

Incentives for Solar

www.dsireusa.org

Database of State Incentives for Renewable Energy



“I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that.”

Thomas Edison 1931


Thank you and
sunny regards.