



## Description of Solar System for the California Shakespeare Theater

The Cooperative Community Energy, Corp. (CCEnergy) will provide the equipment and project management for the installation of a 37.4 kilowatt DC solar electric system on the EBMUD property located at 100 Gateway Blvd, Orinda. Equipment lease and funding will be provided by Mission Capital of Santa Rosa, CA. Installation of the system will be done by Pacific Solar Energy of Pleasanton, CA. license 872167.

The major items equipment will consist of: 144 SunTech Power 260 watt panels (STP260-24/VD); 4 SMA America 9000 watt inverters (SB9000TL-US); and UniRac ULA ground mounting system. Miscellaneous equipment includes: combiner boxes, disconnect switches and circuit breakers. The system will be designed by an engineer that meets current National Electric Code requirements, with a cable/wire line loss of less than 1%. A monitoring system by SMA-America (Sunny Web Box) will provide monitoring of system performance and can be connected to the internet for remote surveillance. The solar panels have a 25 year power output warranty and the inverters have a 10 year warranty.

The equipment will be installed to meet current NEC and Contra Costa County building requirements. The array will be located in the open space north the dirt road leading to the water tanks, approximately 400' from the gate. The UniRac mounting system has been designed by UniRac using their code compliant design systems. The cables from the array to the inverter location and on to the tech booth will be placed in schedule 80 conduit and buried in a trench 24" deep. Existing PG&E and AT&T will be marked by USA to assure that they will be avoided. Precise location of the trench will be agreed upon with EBMUD, but will generally be along-side the dirt road. The inverters will be located in the redwood grove on a metal framework with a roof protecting the equipment from redwood debris. The cables from the inverters will be terminated on a circuit breaker located in an open slot in the distribution bay in the tech room. In addition, a 1" PVC water line to the array will be installed with an interconnection point agreeable to CalShakes, likely near the fire suppression station east of the redwood grove. Pacific Solar Energy has a 10 year warranty on their workmanship.

Our current plan is to cross the dirt road twice to avoid complications with the open culvert/stream 250' downhill from the array; this will be agreed upon with EBMUD. The paved fire road near the tech building will be crossed and the asphalt next to the tech booth will also be saw cut and repaired back to current conditions.

CCEnergy will prepare all of the necessary documents for the County to secure a building permit, for PGE interconnection and for CalShakes operational use. In addition, CCEnergy staff and I personally will be available long term to handle any post installation issues, should they arise. Pacific Solar Energy will secure a signed off building permit and will review system operation and monitoring with designated CalShakes staff. The cost of the building permit (\$4,300 estimate) has been included in the cost of the system.

The issue of EBMUD approval and fees has been an open issue. Scott Hill of EBMUD on 4/12 indicated that they would like to have their use and access applications signed by CalShakes and indicated that this could quickly be handled. Thus the cost of EBMUD permits (\$1,500 estimate) has not been included in the financing proposal.

We will work with Suzie Falk's staff to establish an agreeable schedule, installation details, et cetera so as to have zero impact on CalShakes production schedule. We will assure that the trenching and installation work will not be noticeable to CalShakes patrons.

ARCHITECTS

**LMS<sup>A</sup>**

LEDDY MAYTUM STACY ARCHITECTS

677 HARRISON STREET  
SAN FRANCISCO, CA 94107  
T 415 485 1700  
F 415 485 1717  
W www.lmsarch.com

CONSULTANTS

PROJECT

**CAL SHAKES**  
CALIFORNIA SHAKESPEARE THEATER

CALIFORNIA  
SHAKESPEARE THEATER  
ORINDA, CALIFORNIA

No. REVISION DATE

DATE: 19 JUNE 2009  
JOB No: 0614  
PHASE:  
ISSUED FOR: PHASE 1 BID  
PERMIT No:  
SCALE: 1/32"=1'-0"

SHEET TITLE

PHASE I DIAGRAM

SHEET No.

A1

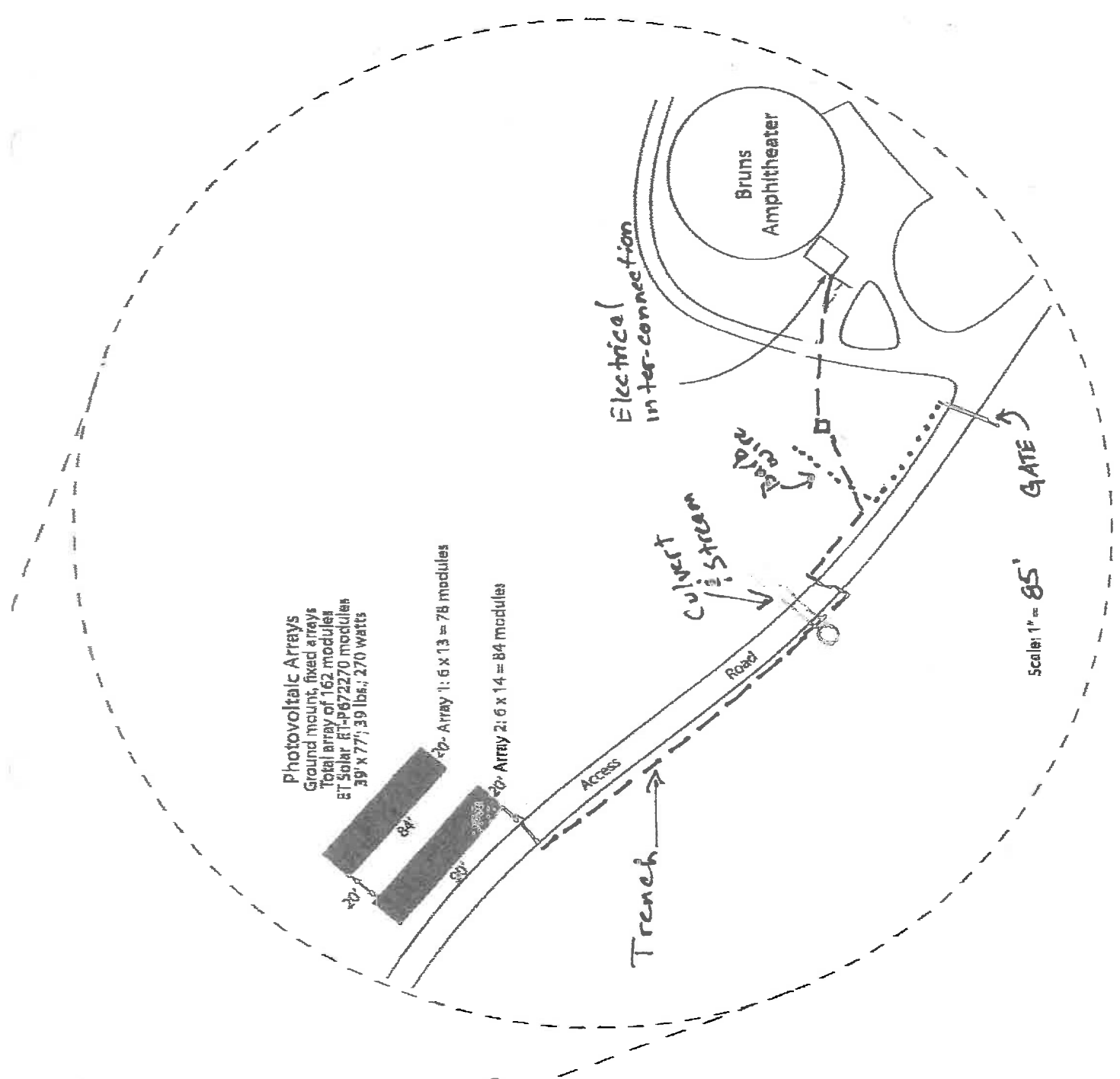
PHASE I SCOPE BOUNDARY

1 PHASE 1 DIAGRAM

1/32"=1'-0"

Trench ---  
 . 2 500' from Array  
 to inter-connect pt  
 . 1' wide; 20" deep  
 . 3" conduit; sched 80

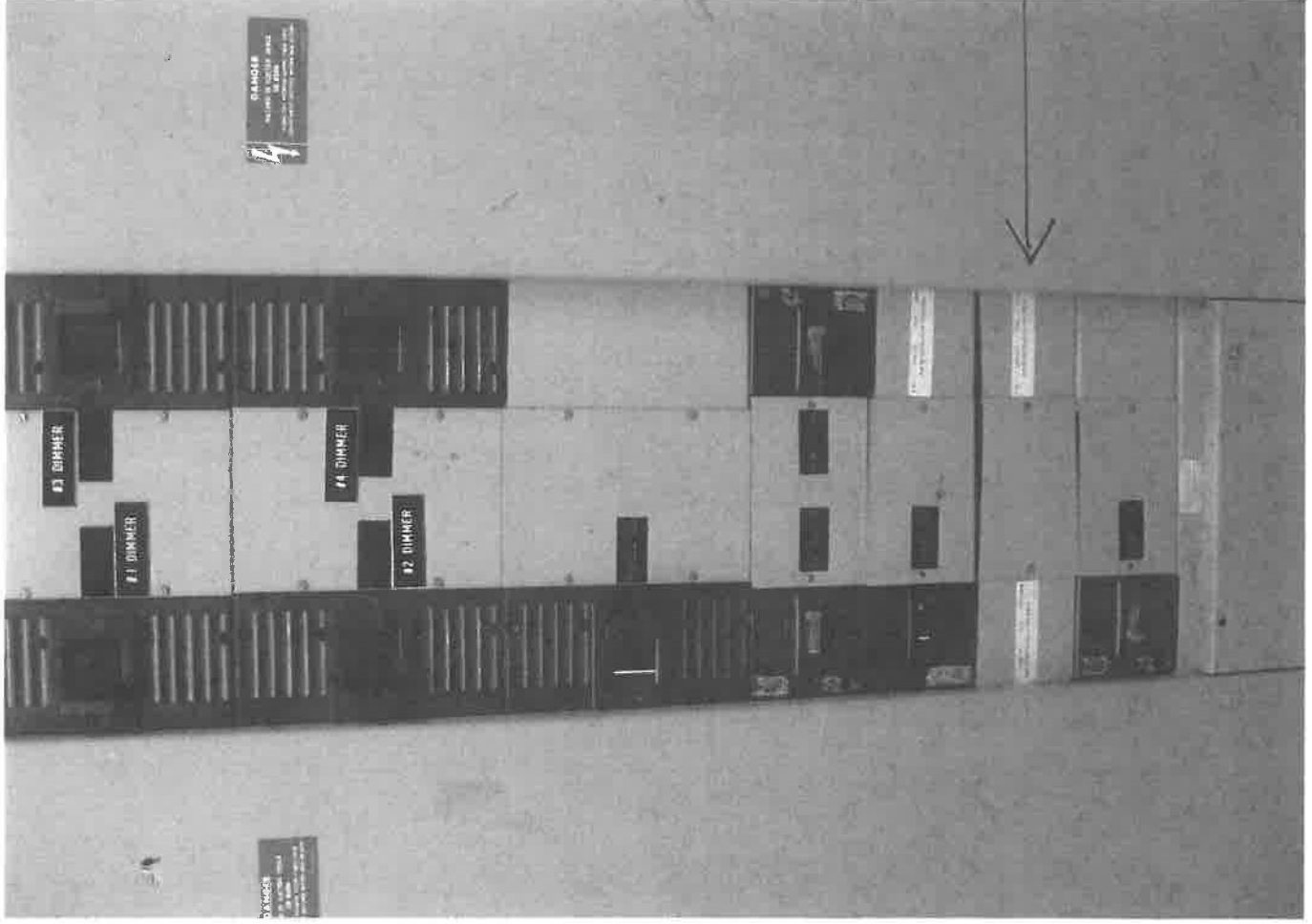
REN 4/20/2011







# DISTRIBUTION BAY in Tech room



Available Disconnect / Circuit Breaker  
for solar. (may be moved to  
bottom location.)

## **Installation activity for the solar project at Cal Shakes**

It is important that the installation of the solar project have no impact on the theater production activities beginning May 9 and running through mid- October. Perhaps the best way to identify potential impact is to define the construction activities, truck traffic and material deliveries. When financing is in place, a detailed schedule will be made in conjunction with the contractor and appropriate CalShakes staff.

### **Construction activities are as follows:**

Installing the array in the open space 350' beyond the gated road: This involves digging about 50 30" deep holes for the posts, securing the posts with concrete, erecting a supporting structure, placement of 150 solar panels and wiring into several disconnect switches. Est. time: 2-3 weeks.

Installing the inverters in the redwood grove about 100' from the Tech booth: this involves building a support frame structure about 15'x 6' with a small roof to hold 5 inverters (about 100 pounds each) and up to 8 disconnect switches. Est. time: 3 days

Installing a circuit breaker on the existing distribution panel in the Tech booth: est. time 2 hrs.

Tapping into one of the two water lines, (ideally the 2") and running a 1" water line to the array with a hose bib which will require shutting the tank valve and draining the water line: Est. time 4 hours.

Trenching from the array to inverters: this will be about 24" deep along the northern side of the dirt road then into the redwood grove. Conduits then are placed in the trench, cables pulled in and then back filled. Est. time 1 week (done in conjunction with array installation)

Trenching from the inverters to tech room: 24" trench, cut asphalt roadway and up to tech booth, place conduit, backfill and repair asphalt, pull-in cables. Est. time is 3 days with road unavailable for one day.

Wiring, testing, commissioning, permit sign-off: est. time 1week

### **Material delivery and contractor truck traffic:**

There will be two possibly three deliveries of material by 24' box trucks to the array and inverter sites consisting of: 500' or 1000' of conduit; several 4' cable reels; 8 pallets of solar panels; 2 pallets of inverters and disconnects; 2 pallets of misc. material.

As of today, it is undecided if a small backhoe/trencher will be used, which would be transported on a 30' flat- bed truck; this would of course require a delivery and pick-up.

Concrete for the array post holes would most likely be with a concrete truck and pumper.

The contractors keep tools and miscellaneous material in their trucks so there might be 2 pickup trucks on site during the work day; workers would park below the main entrance gate.

### **Impact on CalShakes production**

Depending upon financing and project approval, the current plan is to be completed with all construction activities before May 9.

The major activity that will be seen from the public areas will be the trenching, asphalt repair and replanting between the inverter location and the tech booth. If approval nears the May timeframe, this would be the first activity undertaken. Tapping into the water line would also be done prior to arrival on-site of increased levels of production staff.

The installation of the circuit breaker and cable connection in the Tech Booth distribution panel will require depowering the tech booth for about 2-4 hours. This is done by throwing the 800A breaker in the new power plant in the basement of the new building and will not affect any other power circuits. This will be the only power interruption at the Tech booth, as the circuit breaker will remain in the off position until testing/commissioning at the end of the project which requires connectivity to PGE.

Material deliveries (including concrete) are usually scheduled in the morning with most of the activity or parking at the array location. Contractors' trucks will be parked in areas identified by CalShakes.

There is no reason for the contractors or their personnel to be near the stage or other buildings, other than the tech booth for a day or two.

In the unlikely event that contractor work gets extended beyond May 15, work schedules will be adjusted to assure that contractors are off-site when needed. Throughout the project, communication is the key with the proper people involved with plan development, status and potential issue resolution.

### **Items needing input from CalShakes**

Any project of this magnitude requires the resolution of specific operational details. Here is the start of that list beyond those items outlined above: location of sanitation "porta-potty"; internet access point in the tech booth for solar system monitoring; more in-depth knowledge about the water-lines location, and water shut-offs etc.; plan review with EBMUD to assure all work is done in accordance with their requirements; possible review of plans with the proper fire department as the road near the Tech booth will be disrupted for about a day, and other possible issues regarding the road in front of the array.

Anything else? These could be worked now.

Additionally, I have started permitting discussions with the county and will be having discussion with PGE upon completion of our detailed wiring plans. Perhaps there is a project engineer with whom you dealt at PGE that should be our initial contact?

Dick Hansen

CCEnergy

925-708-2113

[dickhansen@ccenergy.com](mailto:dickhansen@ccenergy.com)

3-17-11

## Dick Hansen

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**From:** Hill, Scott <scotth@ebmud.com>  
**Sent:** Tuesday, April 26, 2011 4:16 PM  
**To:** Dick Hansen  
**Subject:** RE: proposed solar array for Cal Shakes in Orinda

Hi Dick,

The proposed array site and trench path are approved. Because the array site is adjacent to a coyote brush scrub community our biologist recommends installing a silt fence around the perimeter of the array site prior to construction to exclude Alameda whipsnakes. The fence can be removed after construction.

If you have any questions, please don't hesitate to ask.

Take care,

Scott

SCOTT HILL | MANAGER OF WATERSHED & RECREATION  
EAST BAY MUNICIPAL UTILITY DISTRICT, 500 SAN PABLO DAM RD, ORINDA, CA 94563  
P: 510.287.2023 | F: 925.254-8320 |

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**From:** Dick Hansen [mailto:dickhansen@ccenergy.com]  
**Sent:** Monday, April 25, 2011 11:52 AM  
**To:** Hill, Scott  
**Subject:** proposed solar array for Cal Shakes in Orinda

Hi Scott: we talked last week about a proposed solar array on EBMUD watershed property near the California Shakespeare facility at 100 Gateway Blvd in Orinda. Last week I placed red flags with the name HORIZON along the proposed trench path and also at the corner spots of the array. Attached is a map showing the proposed path.

We propose to use the south side of the road to avoid the beginnings of stream bed on the north side of the road at the culvert site, thereby eliminating longer term erosion issues. Also, the contractor that we intend to use has stated that he will most likely hand dig the trench to assure that the AT&T and PGE cables are properly protected. Of course USA will be called to mark out those existing cables. (USA markers from 2009 are still evident in the area.)

As shown, the array is to be placed in the existing open area about 350' west of the gate. The trench is 20-24" deep and will cross the road at the array, then proceed downhill to the east on the south side of the road; after crossing above the water culvert, the trench will again cross over the road, then through the redwood grove and terminate in the tech booth at the Cal Shakes building. Total distance is about 500'. A three inch schedule 80 conduit will be placed in the trench to contain the electric wires from the array, and a 1" schedule 40 PVC water line to provide water for periodic cleaning of the arrays. We propose to inter-connect to the existing 1" PVC line near the hose bib on the east side of the paved access road as shown in the photo. The trench will be backfilled with the excavated material.

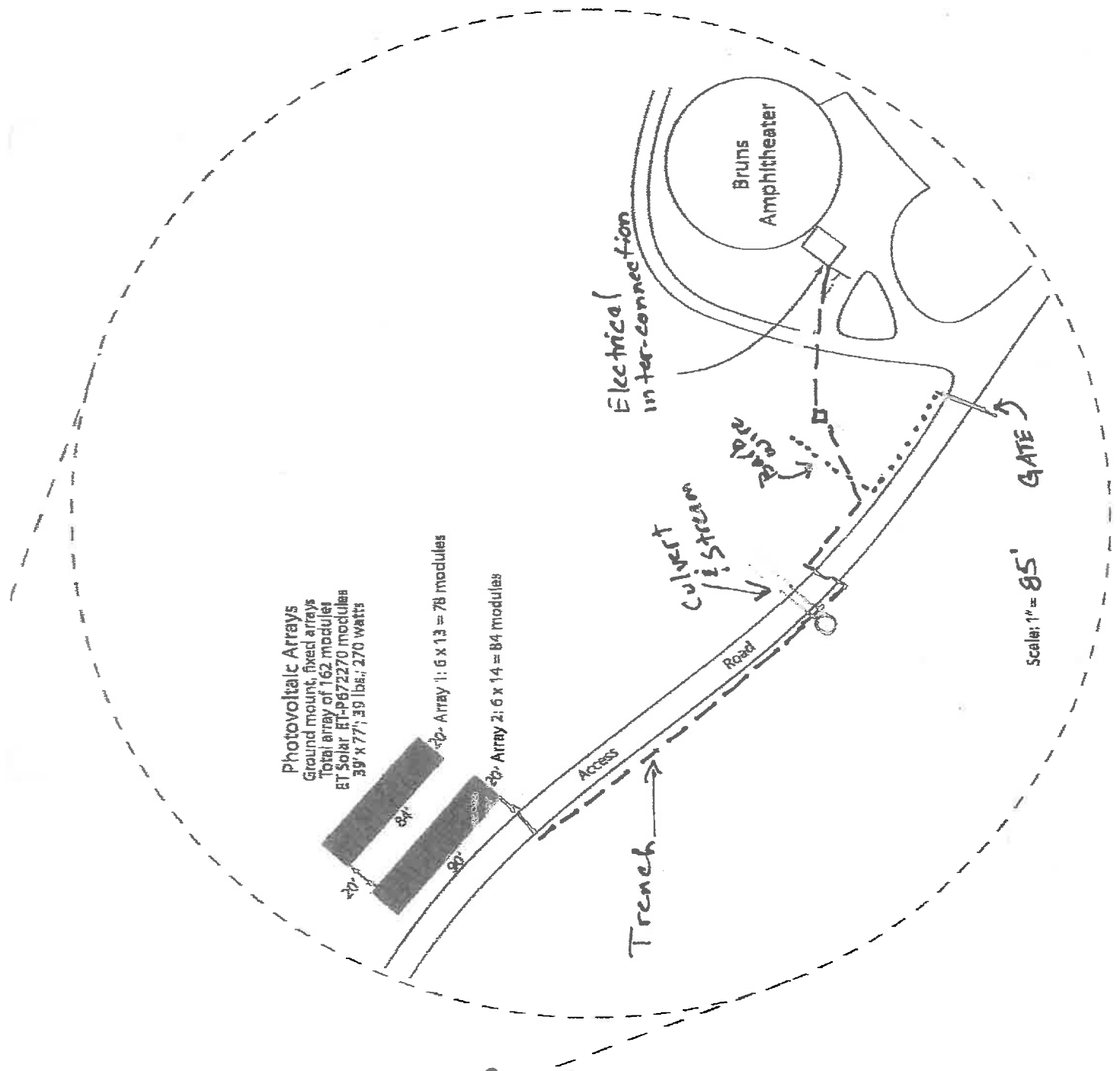
I trust that this provides you with sufficient details to understand the proposal. If there are any questions, please call me 925-708-2113; I of course would be pleased to meet on site with your staff if necessary.

Could you let me know that you have received this note and the usual timeframe for a decision?

Thanks

Trench ---  
 . 2' 500' from Array  
 to inter-connect pt  
 . 1' wide; 20" deep  
 . 3" conduit; sched 80

RCH 4/20/2011



Type Of Use	Application Fee
◆ <b>Fee Title</b> ( <i>Outright purchase of District property</i> )	\$2,000.00
◆ <b>Easement</b> ( <i>Rights for permanent use of District property, such as access, utilities, etc.</i> )	\$1,000.00
◆ <b>Quitclaim</b> ( <i>Removal of District's right, title and interest to property</i> )	\$1,000.00
◆ <b>Revocable License</b> ( <i>Permission to use District property for periods exceeding one year, subject to revocation. For such uses as utility and road crossings of aqueduct properties</i> )	\$500.00
◆ <b>Lease</b> ( <i>The right to occupy and use District land for a specified time period</i> )	\$600.00
◆ <b>Telecommunication Lease</b> ( <i>Long-term lease for PCS, cellular and/or radio uses</i> )	\$2,000.00
◆ <b>Information-only</b> ( <i>Request for information requiring research of District records. Information-only applicants will be charged a fee only if the estimated research time exceeds one hour</i> )	\$60./hr
◆ <b>Processing and Review of Watershed Land Use Proposals</b> ( <i>Request for District to perform a formal evaluation of watershed land use proposal</i> )	\$60./hr (plus all other District costs)
◆ <b>Property Entry Permits, Rights of Entry, Temporary Construction Permits</b> ( <i>Permission for temporary access onto District</i> )	\$100.00
◆ <b>Limited Land Use Permit</b> ( <i>Allows landscaping, gardening or other minor surface use of District property, subject to annual renewal</i> )	\$25.00

The fee category applicable to your request will be determined by the District.

The application fee for your request for \_\_\_\_\_  
is \$ \_\_\_\_\_. Please mail your check made payable to:

**East Bay Municipal Utility District**  
P.O. Box 24055, Oakland, CA 94623  
Attention: Real Estate Services  
Telephone: (510) 287-1244

File No. \_\_\_\_\_

**APPLICATION FOR USE OF EBMUD PROPERTY  
OR REQUEST FOR INFORMATION**

(Please complete this form with as much information as possible. Incomplete applications cannot be processed and will result in delays in the District's response time.)

APPLICANT NAME: \_\_\_\_\_  
(please print)

FIRM (if applicable): \_\_\_\_\_

ADDRESS: \_\_\_\_\_

PHONE: Residence: \_\_\_\_\_ Business: \_\_\_\_\_

ADDRESS/LOCATION OF EBMUD PROPERTY (Attach map or identify with Assessor's Parcel Number):

USE REQUESTED (Give a complete description of your project. Attach an extra sheet, if necessary):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ARE OTHER COUNTY/CITY APPROVALS OR PERMITS REQUIRED?      YES      NO

If yes, please give details.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Under the California Environmental Quality Act (CEQA) your request to use EBMUD property may be considered a project which requires completion of environmental documentation. Has any type of environmental documentation (Negative Declaration or Environmental Impact Report) already been completed for this project? If so, please submit a copy of that documentation, highlighting the area(s) which specifically deal with your requested use of EBMUD property.

ADDITIONAL COMMENTS/REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NOTE: If your project involves any soils studies, engineering plans or environmental documentation, these documents must be attached in duplicate with this application.





Cooperative  
Community  
Energy

## Equipment List

Date: 7/14/2011

Customer Name: California Shakespeare Theater  
Address: 100 Gateway Blvd  
Orinda, California 94563

Description: PV System with SMA inverters, SunTech modules, UniRac ground mounting, water line  
Rated Output: 33276.1 AC Watts

Cooperative Community Energy will supply equipment as listed below for Member's renewable energy system:

<u>Qty</u>	<u>Manufacturer</u>	<u>P/N or Model</u>	<u>Part Description</u>
4	SMA America	SB 9000TLUS-10	Sunny Boy 9,000 watt inverter for 208VAC operation
144	Suntech	STP260-24/VB-1	Suntech 260 watt PV module
48	Unirac	301017	Single SolarMount heavy duty 240 inch rail
96	Unirac	321001-1	Single bottom mount clip
240	Unirac	320021-1	"E & F" top mount mid clamp, clear anodized aluminum
144	Unirac	980004-1	Unirac grounding clip for top mount rail clamps
48	Bumdy	CL50-1TN	Bumdy tin-plated copper lay-in lug connector
1	Square D	QO318L200GRB	Square D QO outdoor load center, 240/120 VAC
4	Square D	QO260	Square D QO circuit breaker, 120/240VAC
4	Square D	HU361RB	Square D disconnect switch, 600VDC/VAC, 30 amp
4	Square D	GTK0610C	Square D ground bar kit
1	Square D	DU324RB	Square D disconnect switch, 240VAC, 200 amp
1	Square D	PKOGTA2	Square D ground bar kit
1	SMA America	SUNNY WEBBOX	Web enabled data logger and control
1	SMA America	SUNNY SENSOR	Sunny WebBox data acquisition monitoring interface
1	SMA America	TEMPSENSOR AMB	Data acquisition for outside ambient temperature
1	SMA America	TEMPSENSOR MOD	Data acquisition for module temperature
4	SMA America	SB RS 485-N	RS 485 communications module for Sunny Boy
22	Unirac	330019	Front pipe leg cap, two inch
22	Unirac	330020	Rear pipe leg cap, two inch
46	Unirac	330021	Pipe slider, flanged for cross bracing, two inch
12	Unirac	330102	10-1/2 foot brace for 2 inch pipe
22	Unirac	330103	14 foot brace for 2 inch pipe
96	Unirac	330104	Rail mounting bracket for 2 inch pipe
4	Labels	Labels	Set of UL required safety labels

### CCEnergy Label Set:

6	CCE-ID	Identification Label with CCEnergy
1	CCE-W-4	Warning Label for Circuit Breaker
5	SOL-CP-812120N-1-X	Laminate for Tyco identification label
5	SOL-CSC-159254-4-0.1	Tyco reflective warning label for solar electrical circuit
4	SOL-DCD-104100-4-0.5	Tyco identification label for DC disconnect
2	SOL-DPS-104019-4-0.5	Tyco identification label for dual electrical power sources
1	SOL-SD-104076-4-0.5	Tyco identification label for AC disconnect
2	SOL-SEC-305254-4-0.1	Tyco reflective warning label for solar electrical system
5	SOL-SRS-812120N-1.4	Tyco identification label with solar system generic rating

Contractor is responsible for all required hardware not listed above. In particular, CCEnergy will not supply any of the following unless specifically requested by the installing Contractor:

- \* miscellaneous conduit, fasteners, wire
- \* sub-panel box and breakers

I have reviewed this equipment list and find it acceptable. I agree to supply any additional materials required to complete the installation. I will not deviate from the design without prior written approval from CCEnergy. I will check the equipment upon delivery to make sure it is complete, and will notify CCEnergy immediately if there are any problems.

\_\_\_\_\_  
Contractor Signature

\_\_\_\_\_  
Date

**TRANSFORMERLESS TECHNOLOGY****Efficient**

- Maximum efficiency of 98.3%
- Transformerless, with H5 topology

**High Yields**

- Superior yield with OptiTrac MPP tracking
- OptiCool™ active temperature management

**Safe**

- SMA Power Balancer for three-phase grid connection
- Integrated DC load disconnect and combiner box
- UL 1741/IEEE-1547 compliant

**SUNNY BOY 8000TL-US / 9000TL-US / 10000TL-US**

Transformerless design, maximum yields

The new Sunny Boy TL-US series is UL-listed for North America and features SMA's innovative H5 topology, resulting in superior efficiencies of up to 98 percent and unmatched solar yields. The transformerless design reduces weight, increases the speed of payback and provides optimum value for any decentralized, commercial PV system. The Sunny Boy TL-US series for North America is the ideal choice for mid-size and large plants from 24 kWp up to the megawatt range.

## Technical data

### Input (DC)

Max. recommended PV power (@ module STC)  
 Max. DC power (@  $\cos \phi = 1$ )  
 Max. DC voltage  
 DC nominal voltage  
 MPP voltage range  
 Min. DC voltage / start voltage  
 Max. input current / per string (at DC combiner box)  
 Number of MPP trackers / fused strings per MPP tracker

### Output (AC)

AC nominal power  
 Max. AC apparent power  
 Nominal AC voltage / adjustable  
 AC voltage range  
 AC grid frequency; range  
 Max. output current  
 Power factor ( $\cos \phi$ )  
 Phase conductors / connection phases  
 Harmonics

### Efficiency

Max. efficiency  
 CEC efficiency

### Protection devices

DC reverse-polarity protection  
 AC short circuit protection  
 Galvanically isolated / all-pole sensitive monitoring unit  
 Protection class / overvoltage category

### General data

Dimensions (W / H / D) in mm (in)  
 DC Disconnect dimensions (W / H / D) in mm (in)  
 Packing dimensions (W / H / D) in mm (in)  
 DC Disconnect packing dimensions (W / H / D) in mm (in)  
 Weight / DC Disconnect weight  
 Packing weight / DC Disconnect packing weight  
 Operating temperature range / full power range  
 Noise emission (typical)  
 Internal consumption at night  
 Topology  
 Cooling concept  
 Electronics protection rating / connection area  
**Features**  
 Display: text line / graphic  
 Interfaces: RS485 / Bluetooth  
 Warranty: 10 / 15 / 20 years  
 Certificates and permits (more available on request)

## Sunny Boy 8000TL-US

### 208 V AC

10000 W  
 8400 W  
 600 V  
 345 V  
 300 V - 480 V  
 300 V / 360 V  
 28 A / 28 A  
 1 / 6 (@ Combiner Box)

8000 W  
 8000 VA  
 208 V / -  
 183 V - 229 V  
 60 Hz; 59.3 - 60.5 Hz  
 40 A  
 1  
 1 / 2  
 < 4%

98.3%  
 98%

•  
 •  
 -/•  
 1 / IV

## Sunny Boy 9000TL-US

### 208 V AC

11250 W  
 9400 W  
 600 V  
 345 V  
 300 V - 480 V  
 300 V / 360 V  
 31 A / 31 A  
 1 / 6 (@ Combiner Box)

9000 W  
 9000 VA  
 208 V / -  
 183 V - 229 V  
 60 Hz; 59.3 - 60.5 Hz  
 44 A  
 1  
 1 / 2  
 < 4%

98.3%  
 98%

•  
 •  
 -/•  
 1 / IV

## Sunny Boy 10000TL-US

### 208 V AC

12500 W  
 10500 W  
 600 V  
 345 V  
 300 V - 480 V  
 300 V / 360 V  
 35 A / 35 A  
 1 / 6 (@ Combiner Box)

10000 W  
 10000 VA  
 208 V / -  
 183 V - 229 V  
 60 Hz; 59.3 - 60.5 Hz  
 48 A  
 1  
 1 / 2  
 < 4%

98.3%  
 97.5%

•  
 •  
 -/•  
 1 / IV

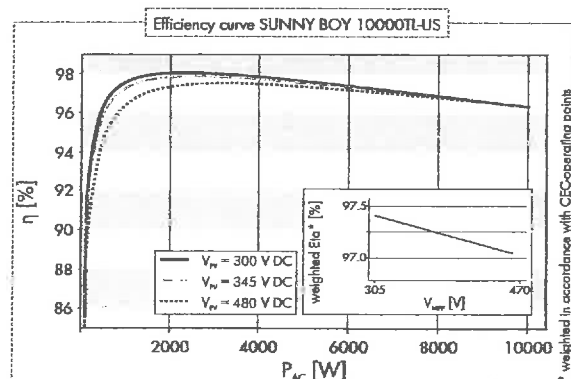
470 / 615 / 240 (18.5 / 24 / 9)  
 187 / 297 / 190 (7 / 12 / 7.5)  
 390 / 580 / 800 (16 / 23 / 31.5)  
 370 / 240 / 280 (15 / 9 / 11)  
 35 kg (77 lb) / 3.5 kg (8 lb)  
 40 kg (88 lb) / 4 kg (9 lb)  
 -25 °C ... +60 °C (-13 °F ... +140 °F) / -25 °C ... +45 °C (-13 °F ... +113 °F)  
 ≤ 46 dB(A)  
 ≤ 0.25 W  
 transformerless H5  
 OptiCool  
 NEMA 3R / NEMA 3R  
 NEMA 3R / NEMA 3R  
 NEMA 3R / NEMA 3R  
 •/-  
 o/o  
 •/o/o  
 •/-  
 o/o  
 •/o/o  
 •/-  
 o/o  
 •/o/o  
 UL1741, UL1998, IEEE 1547, FCC Part 15 (Class A & B), CSA C22.2 No. 107.1-2001

NOTE: US inverters ship with gray lids.

• Standard features    o Optional features    - Not available

Revised August 2010 Data at nominal conditions

Type designation



SB 8000TLUS-10

SB 9000TLUS-10

SB 10000TLUS-10

## Accessories



Sunny Boy Combiner Box  
 SBC8TL6-10  
 (Included with inverter)



Bluetooth® Piggy Back  
 BTBPNY-NR



RS485 interface  
 485USPB-SMC-NR



SMA Power Balancer  
 PBL-SBUS-10-NR

Toll Free +1 888 4 SMA USA  
 www.SMA-America.com

SMA America, LLC

— EXAMPLE —

# 36 KW PHOTOVOLTAIC SYSTEM

(1) SUNNYTOWER ST-36  
36KW INVERTER TOWER

(162) ET-SOLAR ET-P672270 270W  
PHOTOVOLTAIC MODULES

ARRAY 500" FROM INVERTER

GROUND MOUNT ARRAY  
162 ET SOLAR ET-P672270  
Isc = 7.9A, Ipmx = 7.4A  
Vmax = 582.9V

SUB-ARRAY #1

84 ET SOLAR ET-P672270

(9) 270W MODULES IN SERIES

Voc = 392.7V, Vpmax = 327.6V

Isc = 7.9A, Ipmx = 7.4A

(3 STRINGS)

DC DISCONNECT  
SQUARE D  
30A, 600VDC  
(7 TOTAL)

T-BOX

J-BOX

HU361RB

(2) #10 AWG  
(1) #10 AWG GRD  
3/4" CONDUIT  
(1 PLACE)

SUB-ARRAY #2

78 ET SOLAR ET-P672270

(9) 270W MODULES IN SERIES

Voc = 392.7V, Vpmax = 327.6V

Isc = 7.9A, Ipmx = 7.4A

(3 STRINGS)

J-BOX

HU361RB

(2) #10 AWG  
(1) #10 AWG GRD  
3/4" CONDUIT  
(1 PLACE)

T-BOX

J-BOX

HU361RB

(9) 270W MODULES IN SERIES

Voc = 392.7V, Vpmax = 327.6V

Isc = 7.9A, Ipmx = 7.4A

(3 STRINGS)

T-BOX

J-BOX

HU361RB

(6) #6 AWG  
(1) #6 AWG GRD  
1-1/4" CONDUIT  
(6 PLACES)

(18) #8 AWG  
(3) #6 AWG GRD  
2" CONDUIT  
(2 PLACES)

DC HOME RUNS  
(7.9A\*1.56)/(5\*91) = 27A < 75A ok  
Tavg (Summer) = 99deg F + 0deg F (table 310.15(B)(2)(c)) = 99deg F  
V Drop < 1% @ 500ft

FREE AIR

SUPPLEMENTARY  
G.E.

#6 AWG GRD

UNDER-  
GROUND

ST-36 120' FROM MAIN

SUNNYTOWER ST 36  
36 KW, 100A, 208V/120V 3P4W

UNDER-  
GROUND

UTILITY AC DISCONNECT  
SQUARE D  
DU224RB 200A 240V

(E) UTILITY ROOM

TO  
ROUTER  
300' MAX.

(4) #1/0 AWG  
(1) #2 AWG GRD  
2" CONDUIT

(E) MAIN SERVICE PANEL  
1200A 208Y/120V 3P4W

1200A

125A

MAIN GROUNDING  
ELECTRODE

PV SYSTEM OUTPUT CIRCUIT  
(100A\*1.25)/(1\*87) = 144A < 150A ok  
V Drop < 1.2% @ 120ft

# Sunny WebBox™



Web enabled data logging and control for alternative energy systems



System access from any Web browser - anywhere in the world

Recording of daily, monthly and annual energy yield via Sunny Portal™

Remote plant diagnosis

Remote system configuration

Automatic data transfer at chosen intervals

Data storage and display via Ethernet

Compatible with all SMA utility interactive inverters

Low power consumption

Automated communication with Sunny Portal™

The new Sunny WebBox from SMA is a powerful communications tool that allows the operating data of your solar system to be logged and easily transmitted via modem or Ethernet to the Web or directly to your PC. It can also send the data to SMA's new internet portal (Sunny Portal) which provides free long-term data storage and graphical display of your system data. Collected information is stored in common file formats so that you can use it in various spreadsheets, graphs or your own web site. The Sunny WebBox is extremely versatile; making the storage, transmission, management and display of your system data easier than ever before.

# The new way to monitor your system

## A new standard in communication

The Sunny WebBox provides complete plant monitoring, remote diagnosis, data storage and display at an affordable price. It features an integrated HTTP web interface that allows you to access plant information via a PC, regardless of operating system or browser type.

The Sunny WebBox is the link between the Sunny Boy PV plant and its owner. It combines computing power, storage capacity, and versatile communication interfaces in a compact enclosure. Networked with the Sunny Portal, the data-logger offers up-to-date display and control options on the internet.

The Sunny WebBox supports RS232 or RS485 protocols for data transfer to and from all SMA utility interactive inverters.

Data transfer and plant configuration via

the internet is handled either by Ethernet connection or telephone modem. Data transfer is automatic - all you have to do is to set the desired intervals. A single WebBox can monitor up to 50 Sunny Boy inverters, saving even more costs when used in larger Sunny Boy solar systems.

## Around the clock, around the world

Check the status of your PV plant - from your home, your office or anywhere you may be. A PC with an internet browser is all that is needed to access the WebBox.

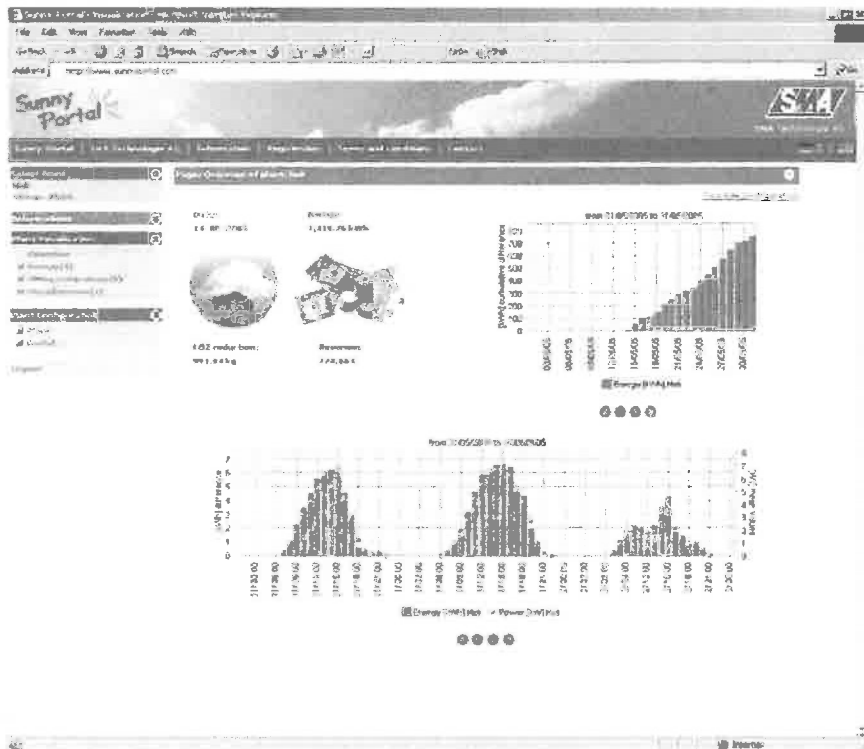
The Sunny WebBox is equipped with its own web server that is preconfigured to work with your internet browser. This allows you to view the output of your plant and the operating channels of each inverter. You can also adjust the parameters of the Sunny WebBox via your web browser.

The Sunny WebBox can also be used in combination with SMA's Sunny Portal Web site ([www.sunnyportal.com](http://www.sunnyportal.com)). Our internet portal offers free graphical presentation of your plant data in charts and diagrams. The Sunny Portal is WebBox ready, simply set up an account and connect the WebBox to the internet.

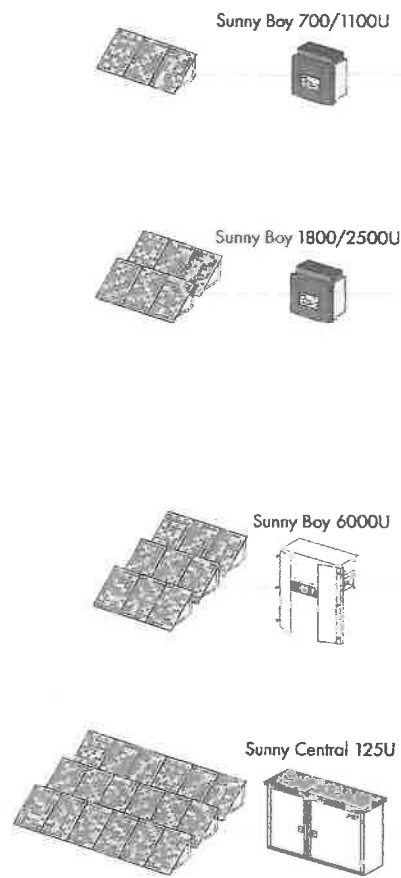
## A perfect match

Sunny WebBox and Sunny Portal are a perfectly matched team. They offer you long-term storage of your solar power plant data, inform you about changes in plant performance, and let you review the performance of your investment at any time, from anywhere.

To learn more about this new method of plant monitoring visit [www.SunnyPortal.com](http://www.SunnyPortal.com). We have set up demonstration accounts that allow you to view actual PV plants. Visit [www.sunnyportal.com](http://www.sunnyportal.com) and see for yourself what the Sunny WebBox and Sunny Portal has to offer.

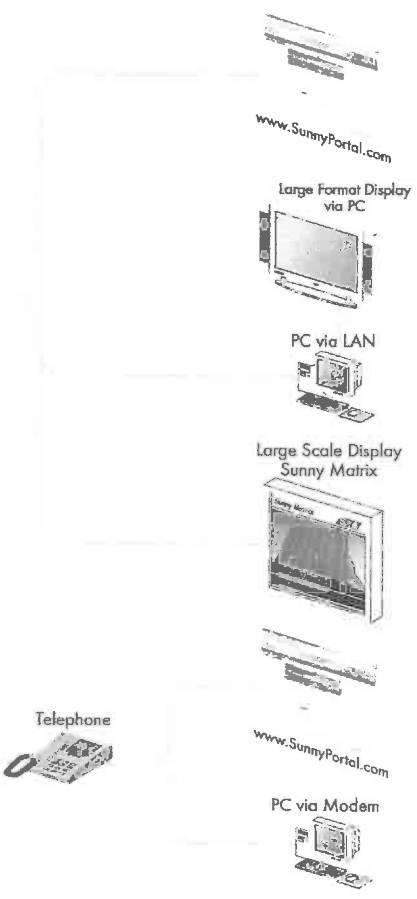
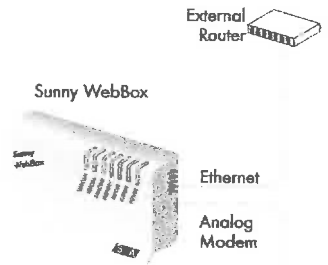


Customer plant in Sunny Portal, 10.4 kWp



Communication with  
inverters via:

- RS485
- Ethernet, TCP/IP\*  
(\*Sunny Central Only)



## Specifications

### Interfaces

SMACOM RS485  
(up to 50 inverters, max. 4000 ft. cable)

Ethernet 10Mb / 100 Mb auto sensing

### External Data Storage

SD-Card from 16 MB upwards  
USB-Stick USB 2.0 Host

### Dimensions

Size 8.85 x 2.25 x 5.11 in. (w x d x h)  
Weight 1.65 lb.

### Power Requirements

Wall Transformer	Typ. 300 mA @ 12 V
(120 VAC 60Hz)	Max. 1 A @ 12 V
Power Consumption	Max. 12W

### Ambient Temperature Rating

Ambient Temperature Range	0°C to 55°C
Relative Humidity Range	5 % to 95 %, non-condensing

### Miscellaneous

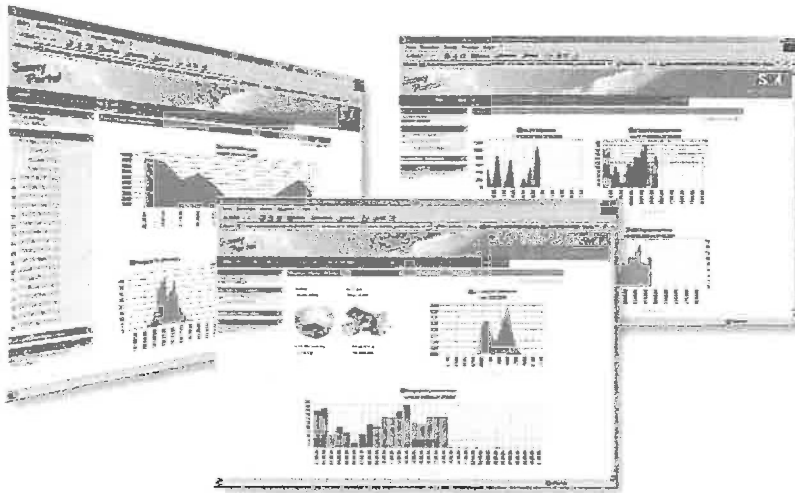
Operating System	Windows CE.NET
Status Display	7 LED's
Mounting Options	Wall mount, DIN rail mount, desktop

### Options

Integrated Analog Modem

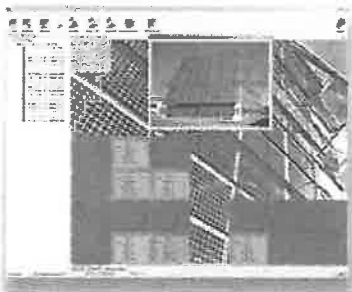
# The SMA family of data technology products

SMA America offers a wide range of data and communication related products to suit any application and budget. From the affordable Sunny Beam wireless system monitor for both home and commercial use, to the advanced data handling ability of the Web Box, SMA has the right product to meet your communication needs.



## Sunny Portal

- Free interactive access to your PV plant
- Storage and individual display of your system data
- Remote monitoring and service via internet
- Free registration at [www.SunnyPortal.com](http://www.SunnyPortal.com)



## Sunny Data Control

- Total plant overview display
- Access system parameters
- Download stored data to PC
- View individual inverter performance



## Sunny Beam

- Monitor and record inverter data
- Wireless operation
- USB for data transfer to PC
- Data storage and individual display via Sunny Data Control
- Power supplied by integrated solar cell



## SMA America Web Site

- For more information and document downloads visit [www.sma-america.com](http://www.sma-america.com)

### Sales Contact:

SMA America, Inc.  
12438 Loma Rica Dr.  
Grass Valley, CA. 95945  
530.273.4895  
[info@sma-america.com](mailto:info@sma-america.com)

[www.sma-america.com](http://www.sma-america.com)







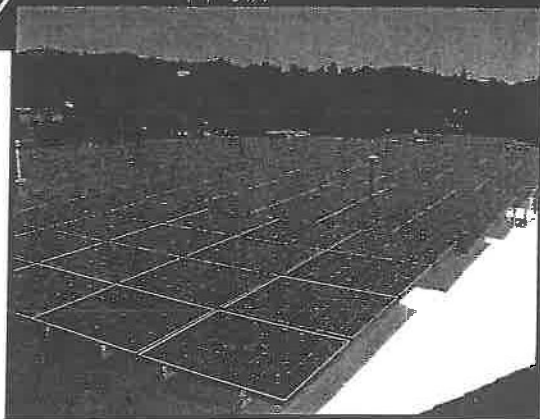
THE STANDARD IN PV MOUNTING STRUCTURES™

A detailed technical line drawing of the U-LA mounting structure, showing multiple parallel rails connected by cross-braces and adjustment mechanisms, illustrating its flexibility for different tilt angles.

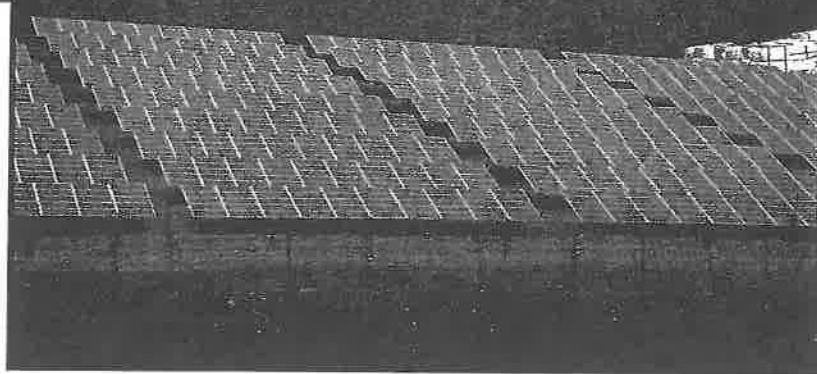
# U-LA™

*Unirac's large array*  
*3 kilowatts to a megawatt plus*

We design U-LAs for a wider range of site and climactic challenges than any other PV structure on the market. It's a cost-effective mounting solution that has grown with the vision of the PV industry. Today U-LA customers routinely reap hundreds of kilowatts per installation.



Commercial roof



Ground

[www.unirac.com](http://www.unirac.com)

Three module mounting systems accommodate your preferences in module orientation and assembly sequence.



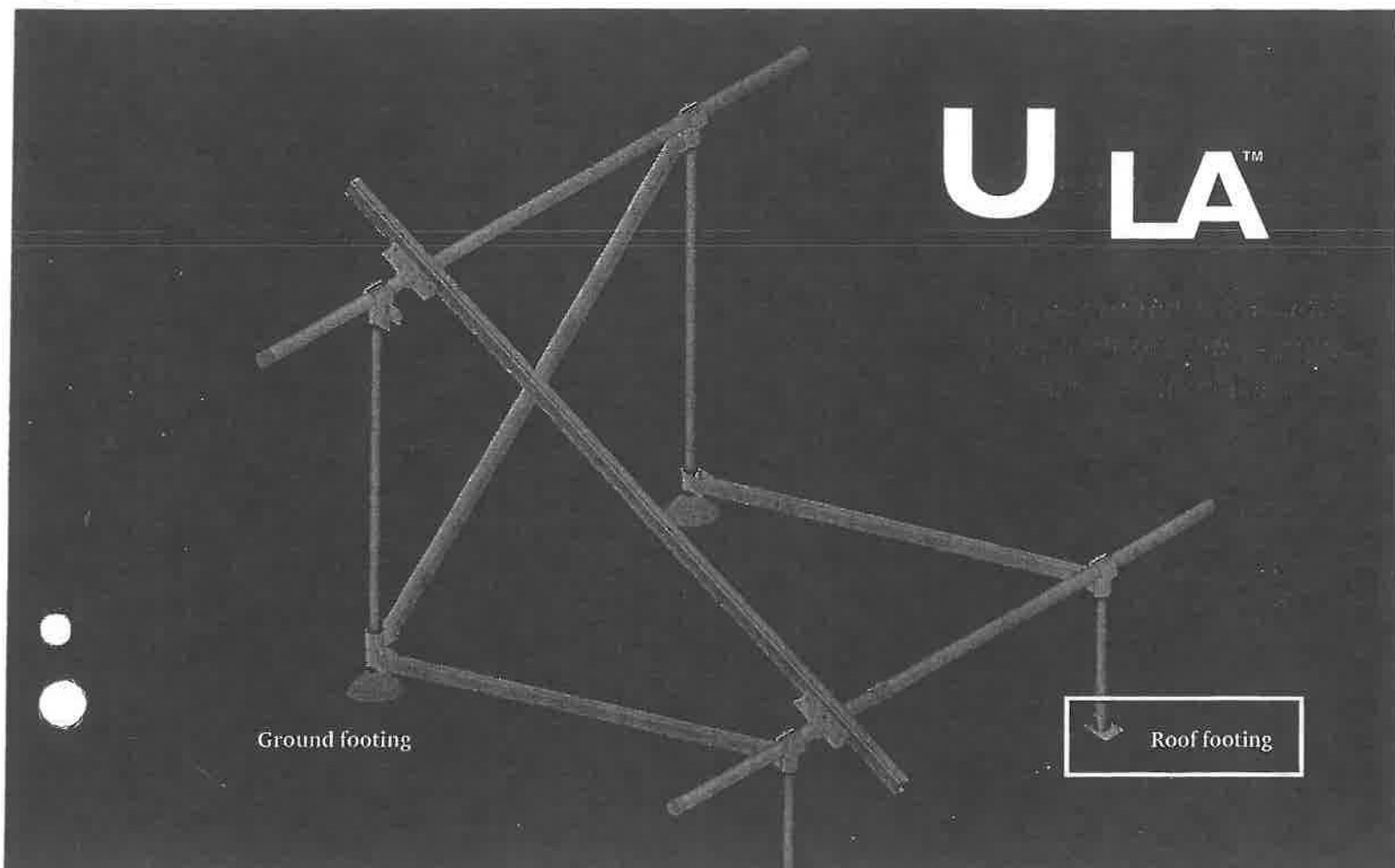
Top mounting clamp



Shared rail bracket

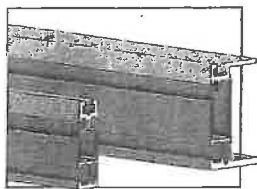


Bottom mounting clip

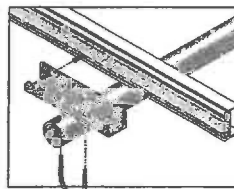


Ground footing

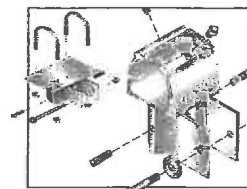
Roof footing



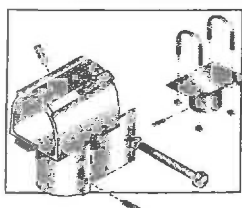
● **SolarMount rail**—Standard or HD (heavy duty) options



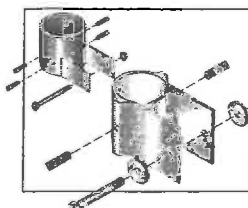
● **Rail mounting bracket**



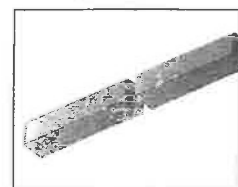
● **Front leg cap**—Aluminum (right) or steel options



● **Rear leg cap**—Aluminum (left) or steel options

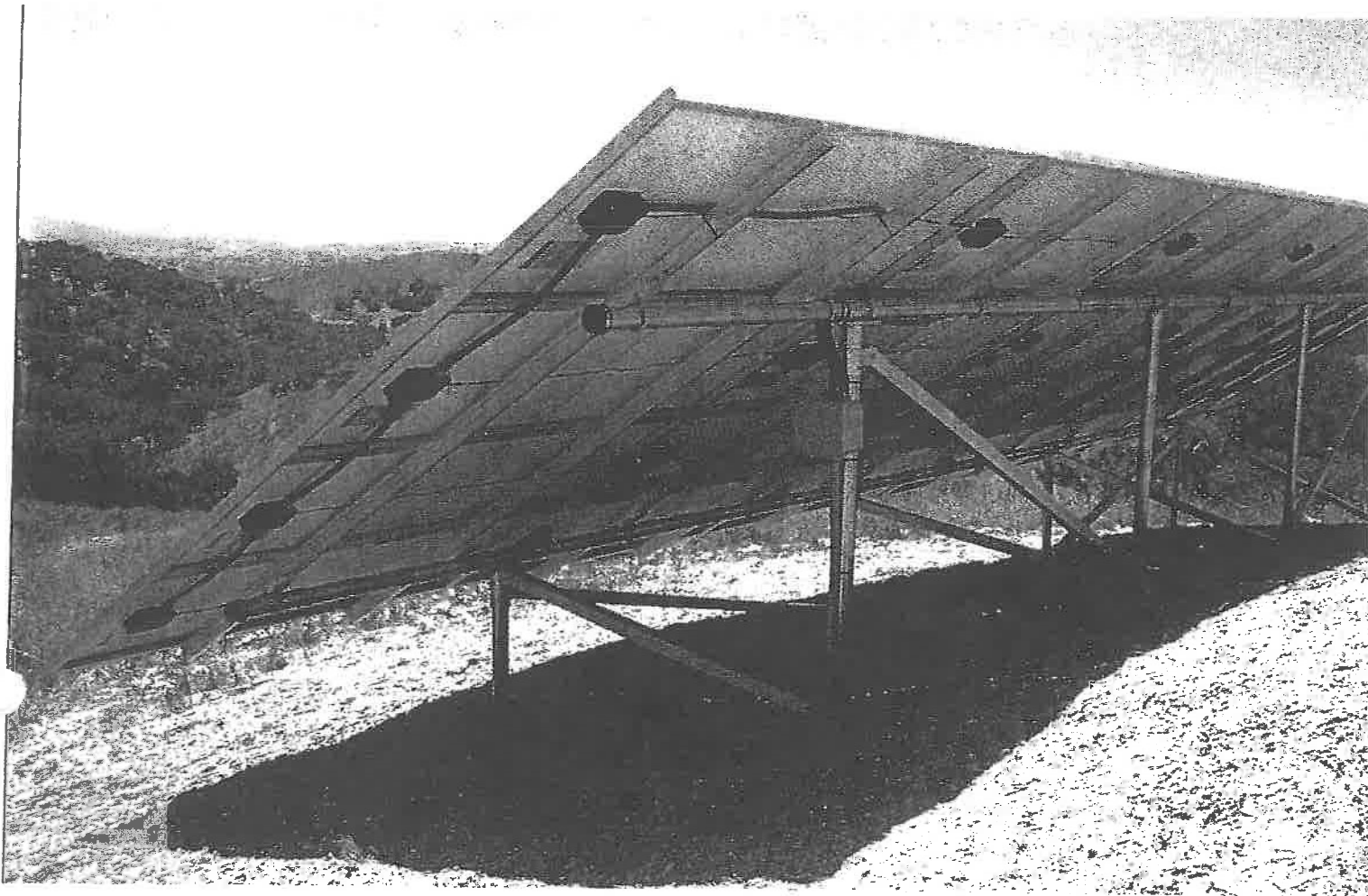


● **Slider**—Aluminum (right) or steel options



● **Cross brace**

■ U-LA's original steel components remain available for installations using 2-, 2½-, or 3-inch Schedule 40 or 80 steel pipe. Use them where extreme wind or seismic conditions take precedence.



### **Stand Up to Mother Nature**

We all know she'll test us: maybe next week, maybe one night 15 years from now. Some challenges are routine: uneven, rocky, sloping terrain or heavy coastal winds that blow year in and year out. Some are extraordinary: Zone 4 seismic events or extreme wind or snow loads may occur only once or twice in the decades of an installation's lifetime. We design U-LAs for those challenges. Every U-LA is diagonally braced for the most severe events. In 30 years, you'll find it where you installed it.

### **Satisfy the Building Inspector**

Larger and larger installations invite closer scrutiny from building departments, especially in urban rooftop venues. U-LA has been permitted in hundreds of projects from New York City to New South Wales. Since inspectors apply local practices as well as broader codes, we're ready with design documentation and reports from our rigorous program of destructive testing. A growing number of building departments have complete confidence in U-LA.

### Count on Experience

Across the United States, Australia, Canada, and the United Kingdom, architects, PEs, building authorities, contractors, and installers have experience and growing confidence in UniRac Large Arrays. Their choices have placed U-LA prominently on the energy landscape.

U LA™

### Component Specifications

#### *6105-T5 aluminum extrusion*

- SolarMount® HD or standard rails
- Brackets and cross braces
- Pipe caps and truss sliders (aluminum option)
- Mounting clips and clamps

#### *Severe Condition 4 (very severe) zinc-plated welded steel*

- Pipe caps and truss sliders (steel option)

#### *18-8 stainless steel*

- Fasteners

#### *ASTM A53 Schedule 40 galvanized steel*

- Installer-supplied legs and cross pipes (2-, 2½-, and 3-inch options)

### Warranty

U-LA is covered by a 10-year limited product warranty and a 5-year limited finish warranty. For complete warranties, download any U-LA installation manual from our web site.



THE STANDARD IN PV MOUNTING STRUCTURES™

1411 Broadway NE, Albuquerque NM 87102-1545 USA

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## Project CalShakes

Quote DRB-LA-090925-16'18

Project Ident: CalShakes

Customer: CC Energy

Contact: Dick Hansen

Revision: 2

Address1: Array 2 of 2

Address: 534 Fourth St #C

Phone: 925-708-2113

Preparer: danb

Address2:

Address2:

Phone2:

City, ST, Zip: Orinda, CA 94563

City, ST, Zip: San Rafael, CA94901

Email: dickhansen@ccenergy.com

## ULA Geometry

Complete

### Module Specification

Suntech - STP260-24/Vb

N-S Dim (in): 39.1 N-S Spacing (in): 1  
E-W Dim (in): 77 E-W Spacing (in): 0.25  
Thickness (in): 1.97 Power Rating (W): 260  
Orientation: L Weight (lbs): 50.71

### Sub-Array Configuration

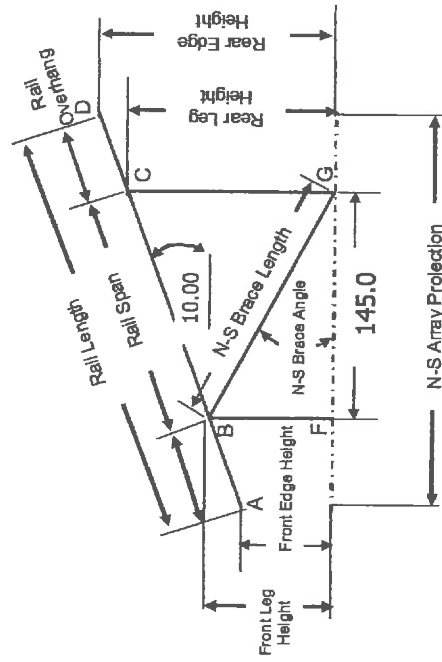
# Rows: 6  
# Columns: 12  
SubArray Modules: 72  
Rails Per Module: 2  
Extended Rail (in): 3

Column N-S Length (in): 241  
Array E-W Dimension (in): 927  
Array N-S Projection (in): 240

### ULA Totals

# SubArrays: 1  
Total Modules: 72  
ULA Power Rating (kW): 18.72

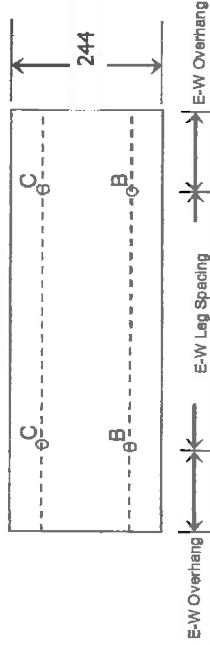
Member Description	Variables	Standard	Revised	Units
Rail Length (in):	AD	244	244	in
Tilt Angle (deg):	$\theta$	10	10	degrees
Rail Span:	BC	146.4	147.24	in
Rail Overhang:	AB, CD	48.8	48.38	in
Front Edge Height:	AE	24	24	in
Rear Edge Height:	DH	66.36	66.36	in
Front Leg Length:	BF	32.47	32.4	in
Rear Leg Length:	CG	57.89	57.96	in
N-S Cross Brace Length:	BG	242.47	148.58	in
N-S Cross Brace Angle:	$\beta$	7.7	12.6	degrees
N-S Leg Spacing:	FG	240.29	145	in



<b>Project CalShakes</b>		<b>Quote DRB-LA-090925-1618</b>	
Project Ident: CalShakes	Customer: CC Energy	Contact: Dick Hansen	Revision 2
Address1: Array 2 of 2	Address: 534 Fourth St #C	Phone: 925-708-2113	Preparer danb
Address2:	Address2:	Phone2:	
City, ST, Zip: Orinda, CA 94563	City, ST, Zip: San Rafael, CA94901	Email: dickhansen@ccoenergy.com	

<b>Horizontal Pipe Design</b>		<b>Complete</b>																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">Pipe Design Inputs</th> </tr> <tr> <td>Pipe Span (E-W Leg Spacing):</td> <td style="text-align: center;">87</td> </tr> <tr> <td>Number of Leg Pairs:</td> <td style="text-align: center;">11</td> </tr> <tr> <td>Horizontal Pipe Overhang (in):</td> <td style="text-align: center;">28.97</td> </tr> </table>	Pipe Design Inputs		Pipe Span (E-W Leg Spacing):	87	Number of Leg Pairs:	11	Horizontal Pipe Overhang (in):	28.97	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">Pipe Design Loads (psf)</th> </tr> <tr> <td>Front Leg (psf):</td> <td style="text-align: center;">18.6</td> </tr> <tr> <td>Rear Leg (psf):</td> <td style="text-align: center;">17.41</td> </tr> <tr> <td colspan="2">Maximum absolute value of Load Combination Loads</td> </tr> </table>	Pipe Design Loads (psf)		Front Leg (psf):	18.6	Rear Leg (psf):	17.41	Maximum absolute value of Load Combination Loads		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">Pipe Design Loads (psf)</th> </tr> <tr> <td>Front Leg (psf):</td> <td style="text-align: center;">18.6</td> </tr> <tr> <td>Rear Leg (psf):</td> <td style="text-align: center;">17.41</td> </tr> <tr> <td colspan="2">Maximum absolute value of Load Combination Loads</td> </tr> </table>	Pipe Design Loads (psf)		Front Leg (psf):	18.6	Rear Leg (psf):	17.41	Maximum absolute value of Load Combination Loads	
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Pipe Design Loads (psf)																										
Front Leg (psf):	18.6																									
Rear Leg (psf):	17.41																									
Maximum absolute value of Load Combination Loads																										

Pipe Material Specifications	Description	Front Horizontal Pipe	Rear Horizontal Pipe
Pipe Selection: 2 in. Schedule 40			
Modulus of Elasticity, E (psf): 4.18E+09	Max Distributed Load (plf):	Max	Max
Moment of Inertia, I (ft^4): 0.0000302	Pipe Span (in):	Revised	Revised
Section Modulus, Z (ft^3): 0.000413	Allowable Bending Moment (lb-ft):	186.78	174.83
Yield Stress, Fy (psf): 5040000	Actual Bending Moment (lb-ft):	87.68	86.91
Array Width (in): 927	Actual/Allowable Moment:	1246.42	1246.42
Rail Length (in): 244	Allowable Total Deflection L/70 (in):	1246.46	1166.71
	Actual Deflection (in):	100%	92%
	Actual/Allowable Deflection:	1.25	1.24
		0.66	0.6
		53%	48%

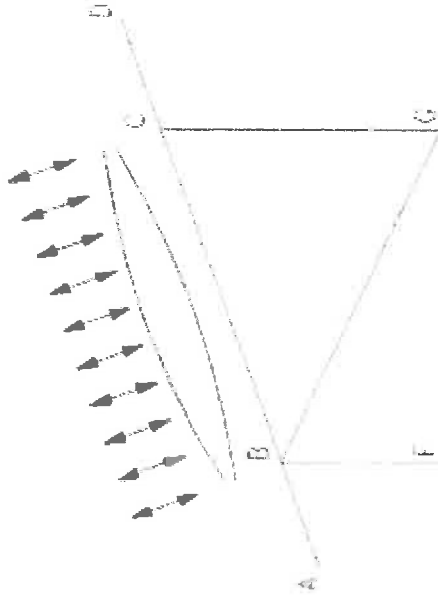


<b>Project</b> CalShakes		<b>Quote</b> DRB-LA-090925-1618	
<b>Project Idnt:</b> CalShakes	<b>Customer:</b> CC Energy	<b>Contact:</b> Dick Hansen	<b>Revision 2</b>
<b>Address1:</b> Array 2 of 2	<b>Address:</b> 534 Fourth St #C	<b>Phone:</b> 925-708-2113	<b>Preparer:</b> danb
<b>Address2:</b>	<b>Address2:</b>	<b>Phone2:</b>	
<b>City, ST, Zip:</b> Orinda, CA 94563	<b>City, ST, Zip:</b> San Rafael, CA94901	<b>Email:</b> dickhansen@ccenergy.com	

### Rail Bending

Complete

Rail Design Variables		Rail Distributed Load Calculation	
Rail Length (in):	244	Maximum Average Design Load (psf):	17
Rail Overhang (in):	48.38	Module Dim Perpendicular to Rails (in):	77
Rail Span (in):	147.24	Rails Per Module:	2
		Distributed Load (plf):	54.54
Rail Material Specifications		Rail Bending Calculations	
Rail Selection: SolarMount HD		Allowable Bending Moment (lb-ft):	1428.19
E (psi): 1.45E+09		Actual Bending Moment (lb-ft):	1026.4
I (ft^4): 0.0000697		Actual/Allowable Moment:	72%
Z (ft^3): 0.000522		Allowable Deflection (in):	2.09
Fy (psi): 2736000		Actual Deflection (in):	1.91
		Actual/Allowable Deflection:	91%





# Project CalShakes

Quote DRB-LA-090925-1618

Project Ident: CalShakes

Customer: CC Energy

Contact: Dick Hansen

Revision 2

Address1: Array 2 of 2

Address: 534 Fourth St #C

Phone: 925-708-2113

Preparer danb

Address2:

Address2:

Phone2:

City, ST, Zip: Orinda, CA 94563

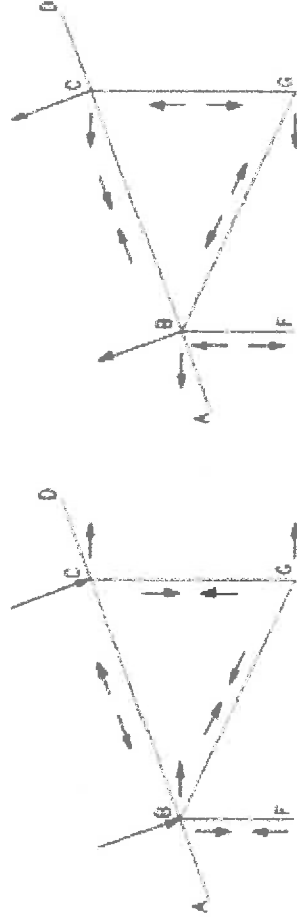
City, ST, Zip: San Rafael, CA94901

Email: dickhansen@ccoenergy.com

## Force Analysis

Complete

Angles		Design Loads		
Tilt Angle (deg):	10	Downforce		Uplift
Cross Brace Angle (deg):	12.6	Front Leg (psf / kip):	18.6 1.37	-5.8 -0.43
E-W Leg Spacing)	87	Rear Leg (psf / kip):	17.41 1.28	-7.54 -0.56
Rail Length:	244			



Maximum Component Forces (kips)			
Axial Force In Front Leg:		Down Force	Uplift
		1.35	-0.42
Axial Force In Front Cap:		1.83	-0.49
Shear Force Front Cap:		0.48	Max Magnitude
Axial Force In Rear Leg:		1.26	-0.55
Axial Force In Rear Cap:		1.04	-0.45
Shear Force Rear Cap:		0.22	Max Magnitude
Shear Force Rear Foot:		0.48	Max Magnitude
Axial Force In N-S Brace:		0.48	-0.07
Resultant Shear N-S Brace:		0.47	Max Magnitude
Resultant Axial N-S Brace:		0.1	-0.02
Axial Force Rail:		0.22	-0.1
Resultant Shear Rail:		0.04	Max Magnitude
Resultant Axial Rail:		0.22	-0.1



# Project CalShakes

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Revision 2

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Preparer danb

Address2:

Address2:

Phone2:

City, ST, Zip: Orinda, CA 94563

City, ST, Zip: San Rafael, CA94901

Email: dickhansen@cccenergy.com

## Column Buckling Analysis

Complete

Front Leg Design	Rear Leg Design	Rail Design	N-S - Cross Brace Design
<b>Pipe Selection:</b> 2 In. Schedule 40  E (ksi): 29 Fy (ksi): 35 r (in): 0.791	<b>Pipe Selection:</b> 2 In. Schedule 40  E (ksi): 29 Fy (ksi): 35 r (in): 0.791	<b>Rail Selection:</b> SolarMount HD  E (ksi): 10.1 Fy (ksi): 19 r (in): 1.1679  Rails per EW Leg: 2.25	<b>Cross Brace Selection:</b> 2" x 2" Aluminum Square Tube  E (ksi): 10.1 Fy (ksi): 19 r (in): 0.7672
Front Leg Column Calculations	Rear Leg Column Calculations	Rail Column Calculations	Cross Brace Column Calculations
Length: 32.4 Eff. Column Len. Fac: 1 Eff. Column Length: 32.40 Slenderness Ratio: 40.96 Critical Force: 19.24 Actual Force: 1.35 Ratio To Allowable: 7.02%	Length: 57.96 Eff. Column Len. Fac: 1 Eff. Column Length: 57.96 Slenderness Ratio: 73.27 Critical Force: 15.93 Actual Force: 1.26 Ratio To Allowable: 7.91%	Length: 147.24 Eff. Column Len. Fac: 1 Eff. Column Length: 147.24 Slenderness Ratio: 126.07 Critical Force: 3.4 Actual Force: 0.22 Ratio To Allowable: 6.47%	Length: 148.58 Eff. Column Len. Fac: 1 Eff. Column Length: 148.58 Slenderness Ratio: 193.67 Critical Force: 1.27 Actual Force: 0.48 Ratio To Allowable: 37.80%

<b>Project CalShakes</b>		<b>Quote DRB-LA-090925-1618</b>	
<b>Project Ident:</b> CalShakes <b>Address1:</b> Array 2 of 2 <b>Address2:</b> <b>City, ST, Zip:</b> Orinda, CA 94563		<b>Customer:</b> CC Energy <b>Address:</b> 534 Fourth St #C <b>Address2:</b> <b>City, ST, Zip:</b> San Rafael, CA94901	
<b>Contact:</b> Dick Hansen <b>Phone:</b> 925-708-2113 <b>Phone2:</b> <b>Email:</b> dickhansen@cccenergy.com		<b>Revision 2</b> <b>Preparer</b> danb	

<b>Seismic Design and Analysis</b>				Complete
Seismic Analysis Inputs		Seismic Analysis Results		
<b>ASCE7-05 Methodology</b>  Latitude: 0 Longitude: 0 Site Class: A Importance Factor: 0 Roof Height: 0 Component Height: 0  Ss: 0 SI: 0 Fa: 0 Fv: 0		Sms: 0    Eq # 16 -37 Sm1: 0    Eq # 16 - 38 Sds: 0    Eq # 16 -39 Sd1: 0    Eq # 16 -40 Ap, Rp: 1.0, 1.5    Table 13.6 - 1 Fp LRFD: 0    Eq 13.3 - 1 Fp ASD: 0.44    per 13.1.7		
<b>- OR - Seismic Zone: IV</b>		<b>Direct Methodology</b>		
Cross Brace Pairs: 3		Fp ASD: 0.44  Array Weight: 10995 Total Axial Force: 4837.91    lbs		
		<b>E-W - Cross Brace Design</b>  Cross Brace Selection: 2" x 2" Aluminum Square Tube E (ksi): 10.1 Fy (ksi): 19 r (In): 0.7672 Area (sq In): 0.9375  Cross Brace Column Calculations:  Max CB Length: 104.46 Eff. Column Len. Fac: 2 Eff. Column Length: 208.92 Slenderness Ratio: 136.16 Critical Force: 1.27    Kip Actual Force: 0.81    Kip Margin Ratio: 63.8%		

## Project CalShakes

Quote DRB-LA-090925-1618

Project Ident: CalShakes

Customer: CC Energy

Contact: Dick Hansen

Revision 2

Address1: Array 2 of 2

Address: 534 Fourth St #C

Phone: 925-708-2113

Preparer danb

Address2:

Address2:

Phone2:

City, ST, Zip: Orinda, CA 94563

City, ST, Zip: San Rafael, CA94901

Email: dickhansen@ccenergy.com

## Footing Design

Complete

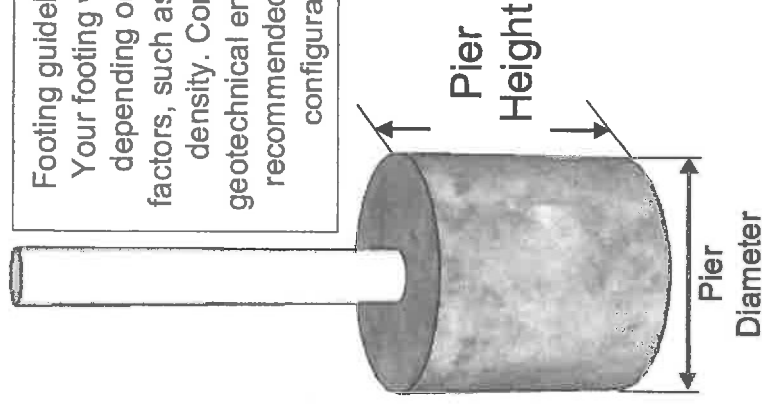
### Footing Design Inputs

Footing Diameter:	12	In.
Footing Depth:	30	In.
Concrete Density:	0.15	Kcf
Soil Density:	0.1	Kcf

### Footing Design Calculations

Max Uplift Force:	0.55	Kip
Safety Factor:	1.67	
Required Resisting Force:	0.92	Kip
Concrete Volume:	1.96	cf
Concrete Weight:	0.29	Kip
Soil Volume:	22.24	cf
Soil Weight:	1.11	Kip
Total Weight:	1.4	Kip
Margin Ratio:	65.61%	

Footing guideline only.  
Your footing will vary depending on many factors, such as your soil density. Consult a geotechnical engineer for recommended footing configuration



<b>Project CalShakes</b>		<b>Quote DRB-LA-090925-1618</b>	
<b>Project Ident:</b> CalShakes	<b>Customer:</b> CC Energy	<b>Contact:</b> Dick Hansen	<b>Revision 2</b>
<b>Address1:</b> Array 2 of 2	<b>Address:</b> 534 Fourth St #C	<b>Phone:</b> 925-708-2113	<b>Preparer:</b> danb
<b>Address2:</b>	<b>Address2:</b>	<b>Phone2:</b>	
<b>City, ST, Zip:</b> Orinda, CA 94563	<b>City, ST, Zip:</b> San Rafael, CA94901	<b>Email:</b> dickhansen@ccenergy.com	

Cap and Foot Design		Complete	
Front Cap Design		Rear Cap Design	
Cap Selection: Aluminum- 2" Front Cap Pipe Selection: 2 In. Schedule 40		Cap Selection: Aluminum- 2" Front Cap	
Axial Compression (kip)	Axial Tension (kip)	Axial Compression (kip)	Axial Tension (kip)
Allowable: 7.272	-2.4	7.272	-2.4
Actual: 1.83	-0.49	1.26	-0.55
Margin Ratio: 25.17%	20.42%	17.33%	22.92%
Shear (kip)	Shear (kip)	Shear (kip)	Shear (kip)
2.424	2.424	2.424	2.424
0.48	0.48	0.22	0.22
19.80%	19.80%	9.08%	9.08%
Front Foot Design		Rear Foot Design	
Axial Compression (kip)	Axial Tension (kip)	Axial Compression (kip)	Axial Tension (kip)
Actual: 1.83	-0.49	1.26	-0.55
0	0	0.48	0.48

<b>Project CalShakes</b>		<b>Quote DRB-LA-090925-1618</b>	
<b>Project Id:</b> CalShakes	<b>Customer:</b> CC Energy	<b>Contact:</b> Dick Hansen	<b>Revision 2</b>
<b>Address1:</b> Array 2 of 2	<b>Address:</b> 534 Fourth St #C	<b>Phone:</b> 925-708-2113	<b>Preparer:</b> danb
<b>Address2:</b>	<b>Address2:</b>	<b>Phone2:</b>	
<b>City, ST, Zip:</b> Orinda, CA 94563	<b>City, ST, Zip:</b> San Rafael, CA 94901	<b>Email:</b> dickhansen@ccenergy.com	

### Design Margin Ratios

Design Specifications and Ratios			
Horizontal Pipe: 2 In. Schedule 40			
	Front		Rear
Pipe Moment:	98%	Pipe Moment:	92%
Pipe Deflection:	52%	Pipe Deflection:	48%


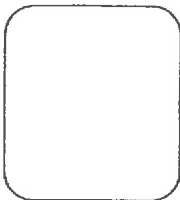





Vertical Pipe Specifications and Column Design Ratios	
Front Leg Buckling:	7.02%
Rear Leg Buckling:	7.91%
N-S Brace Buckling:	37.80%

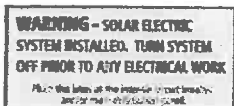

Connection Specifications and Design Ratios			
Cap Selection: Aluminum- 2" Front Cap			
	Front		Rear
Axial Compression:	25.17%	Axial Compression:	17.33%
Axial Tension:	20.42%	Axial Tension:	22.92%
Shear:	19.80%	Shear:	9.08%

Rail Specification, Beam and Column Design Ratios	
Rail Selection: SolarMount HD	
Rail Bending Moment:	72%
Rail Bending Deflection:	91%
Rail Buckling:	6.47%

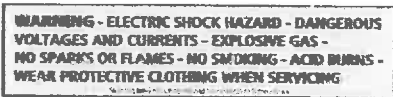
Seismic Design Ratios	
Margin Ratio:	63.8%
Margin Ratio:	65.61%

CCEnergy Warning Label Chart

	TY:SOL-SRS-812120N-1-4	"Tyco identification label with solar system <b>Generic Rating</b> "
	3.75"H x 3.25"L	2 per system - 1 on DC disconnect with DC info and 1 on AC Disconnect with AC info
	TY:SOL-CP-812120N-1-X	" <b>Laminate</b> for Tyco identification label with solar system generic rating"
	3.75"H x 3.25"L	2 Per System - Affixes over the Solar System Generic Rating label, once written on.
	TY:SOL-DCD-104100-4-0.1	"Tyco identification label for <b>DC disconnect</b> "
	2 part label Top is .75"H x 4.125"L Bottom is 3"H x 4.125"L	1 Per DC Disconnect, including inverter integrated ones 1 Per Combiner Box, if applicable (bottom portion only, unless combiner box has a disconnect switch)
	TY:SOL-SD-104076-4-0.5	"Tyco Identification label for <b>AC disconnect</b> "
	2 part label Top is .75"H x 4.125"L Bottom is 3"H x 4.125"L	1 Per AC Disconnect, including inverter integrated ones 1 Per Battery Disconnect, if applicable (bottom portion only)
	TY:SOL-CSC-159254-4-0.1	"Tyco <i>reflective</i> warning label for solar <b>electrical circuit</b> "
	1"H x 6.25"L	Approx. 5 per System - For conduit. Every 10'-20' on horizontal runs and at eye-level on vertical runs
	TY:SOL-SEC-305254-4-0.1	"Tyco <i>reflective</i> warning label for solar <b>electrical system</b> "
	1"H x 12"L	2 per System - 1 on outside of main panel and 1 on inside of main panel
	TY:SOL-DPS-104019-4-0.1	"Tyco identification label for <b>dual</b> electrical <b>power sources</b> "
	.75"H x 4.125"L	2 Per system - one on outside of main panel and one on inside of main panel

	LA:CCE-W-4	"Warning label for <b>circuit breaker</b> "
	1"H x 2"L	1 per System - Next to circuit breaker in main panel
	Being produce (if the meantime, please use the bottom part of LA:CCE-IL-1)	Once produced, will be " <b>CCEnergy Identification</b> sticker"but for now is "Informaton Label for AC Disconnect Switch"
	2"H x 3.5"L	1 on Main Panel AND 1 on each Inverter

If the PV System has a battery backup, then add:

	LA:CCE-W-3	"Warning label for <b>battery</b> "
	1.5"H x 6"L	1 per System - on battery box or entrance to battery room

#### Quick Reference Chart - Typical System

2 per system - 1 on AC and 1 on DC disconnect  
2 per system - 1 on AC and 1 on DC disconnect  
1 per DC Disconnect  
1 per AC Disconnect  
Approx. 5 per system - for conduit  
2 per system - Outside and inside main panel  
2 per system - Outside and inside main panel  
1 per system - on Circuit Breaker in Main Panel  
1 for main panel plus 1 for each Inverter

SOL-SRS-812120N-1.4  
SOL-CP-1812120N-1-X  
SOL-DCD-104100-4-0.1  
SOL-SD-104076-4-0.5  
SOL-CSC-159254-4-0.1  
SOL-SEC-305254-4-0.1  
SOL-DPS-104019-4-0.1  
LA:CCE-W-4  
LA:CCE-IL-1

Tyco identification label with solar system **Generic Rating Laminate** for Tyco identification label  
Tyco identification label for **DC disconnect**  
Tyco identification label for **AC disconnect**  
Tyco reflective warning label for solar **electrical circuit**  
Tyco reflective warning label for solar **electrical system**  
Tyco identification label for **dual electrical power sources**  
Warning Label for **Circuit Breaker**  
Use bottom portion as the **CCEnergy Identification** Sticker

#### For systems with combiner boxes or battery backup

1 per Combiner Box (use bottom portion only if no disconnect)  
1 per Battery Disconnect Switch  
1 per Battery Box or Battery Room Door

SOL-DCD-104100-4-0.1  
SOL-SD-104076-4-0.5  
LA:CCE-W-3

Tyco identification label for **DC disconnect**  
Tyco identification label for **AC disconnect (bottom portion only)**  
Warning Label for **Battery**

#### Notes regarding the Generic Rating stickers for AC & DC Disconnects

- \* Values should include units i.e. Aac, Adc, Vdc Vac
- \* DC Sticker should have all information filled out
- \* AC Sticker only needs to have the top 3 items filled out (Max Power = Inverter Rating)