**HISTORIC AND DESIGN REVIEW COMMISSION**

**June 01, 2016**

**Agenda Item No: 4**

| | |
|---|---|
| **HDRC CASE NO:** | **2016-195** |
| **ADDRESS:** | 114 NORTH DR |
| **LEGAL DESCRIPTION:** | NCB 6705 BLK 15 LOT 25 |
| **ZONING:** | R6 H |
| **CITY COUNCIL DIST.:** | 7 |
| **DISTRICT:** | Monticello Park Historic District |
| **APPLICANT:** | South Texas Solar Systems |
| **OWNER:** | Anthony & Cynthia Smith |
| **TYPE OF WORK:** | Installation of Solar Panels |

**REQUEST:**

The applicant is requesting a Certificate of Appropriateness for approval to install 26 solar panels on West, South and East portions of the roof.

**APPLICABLE CITATIONS:**

*Historic Design Guidelines, Chapter 3, Guidelines for Additions*

6. Designing for Energy Efficiency

C. SOLAR COLLECTORS
*i. Location*—Locate solar collectors on side or rear roof pitch of the primary historic structure to the maximum extent feasible to minimize visibility from the public right-of-way while maximizing solar access. Alternatively, locate solar collectors on a garage or outbuilding or consider a ground-mount system where solar access to the primary structure is limited.
ii. Mounting (sloped roof surfaces)—Mount solar collectors flush with the surface of a sloped roof. Select collectors that are similar in color to the roof surface to reduce visibility.
*iii. Mounting (flat roof surfaces)*—Mount solar collectors flush with the surface of a flat roof to the maximum extent feasible. Where solar access limitations preclude a flush mount, locate panels towards the rear of the roof where visibility from the public right-of-way will be minimized.

**FINDINGS:**

a. The applicant has proposed to install a 26 solar panel on the asbestos shingles roof of the primary structure. The Staff visited the site on May 25, 2016, and found that given the set back and orientation of the accessory structure and the neighboring structures, the proposed solar installation will not be seen from the public right of way. This is consistent with Guidelines for Additions 6.C., which states installations, should be in locations that minimize visibility from the public right-of-way.
b. There will be six sub-arrays, both mounted on pitched roof with composite shingle using SolAttach feet. Feet are screwed into the roof and the panels are attached to the feet. The panels will be flush mounted on each pitch; the clamps holds the panels 3” above the roof. This is consistent with Guidelines for Additions 6.C.ii, which states solar collectors should be flush with the roof surface.

**RECOMMENDATION:**

Staff recommends approval as submitted based on findings a and b.

**CASE MANAGER:**

Lauren Sage


N

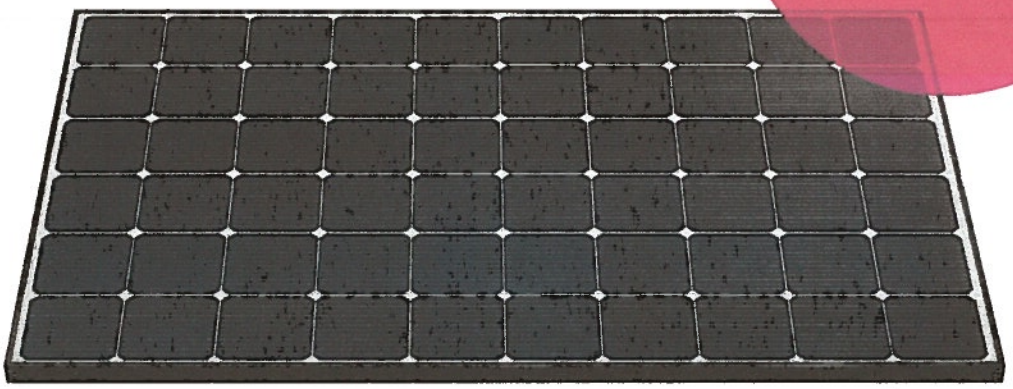
# Flex Viewer

**Powered by ArcGIS Server**

Printed:May 17, 2016

LG
Life's Good

# Innovation for a Better Life



## LG NeON™ 2 LG315N1C-G4

## 60 cell

LG's new module, LG NeON™ 2, adopts Cello technology. Cello technology replaces 3 busbars with 12 thin wires to enhance power output and reliability. LG NeON™ 2 demonstrates LG's efforts to increase customer's values **beyond efficiency. It features enhanced warranty, durability,** performance under real environment, and aesthetic design suitable for roofs.

APPROVED PRODUCT
KM 564573 BS EN 61215
Photovoltaic Modules

### Enhanced Performance Warranty

LG NeON™ 2 has an enhanced performance warranty. The annual degradation has fallen from -0.7%/yr to -0.6%/yr. Even after 25 years, the cell guarantees 2.4%p more output than the previous LG NeON™ modules.

### High Power Output

Compared with previous models, the LG NeON™ 2 **has been designed to significantly enhance its output efficiency, thereby making it efficient even in limited space.**

### Aesthetic Roof

LG NeON™ 2 has been designed with aesthetics in mind; thinner wires that appear all black at a distance. The product may help increase the value of a property with its modern design.

### Outstanding Durability

With its newly reinforced frame design, LG has extended the warranty of the LG NeON™ 2 for an additional 2 years. Additionally, LG NeON™ 2 can endure a front load up to 6000 Pa, and a rear load up to 5400 Pa.

### Better Performance on a Sunny Day

LG NeON™ 2 now performs better on sunny days thanks **to its improved temperature coefficiency.**

### Double-Sided Cell Structure

The rear of the cell used in LG NeON™ 2 will contribute to **generation, just like the front; the light beam reflected from** the rear of the module is reabsorbed to generate a great amount of additional power.

**About LG Electronics**

LG Electronics is a global player who has been committed to expanding its capacity, based on solar energy business as its future growth engine. We embarked on a solar energy source research program in **1985, supported by LG Group's rich experience in semi-conductor, LCD, chemistry, and materials industry. We successfully released the first Mono X® series to the market in 2010, which were exported to 32** countries in the following 2 years; thereafter. In 2013, LG NeON™ (previously known as Mono X® NeON) won "Intersolar Award", which proved LG is the leader of innovation in the industry.

# LG NeON™2 LG315N1C-G4

## Mechanical Properties

| | |
|---|---|
| **Cells** | 6 x 10 |
| **Cell Vendor** | LG |
| **Cell Type** | Monocrystalline / N-type |
| **Cell Dimensions** | 156.75 x 156.75 mm / 6 inches |
| **# of Busbar** | 12 (Multi Wire Busbar) |
| **Dimensions (L x W x H)** | 1640 x 1000 x 40 mm<br>64.57 x 39.37 x 1.57 inch |
| **Front Load** | 6000 Pa / 125 psf |
| **Rear Load** | 5400 Pa / 113 psf |
| **Weight** | 17.0 ± 0.5 kg / 37.48 ± 1.1 lbs |
| **Connector Type** | MC4, MC4 Compatible, IP67 |
| **Junction Box** | IP67 with 3 Bypass Diodes |
| **Length of Cables** | 2 x 1000 mm / 2 x 39.37 inch |
| **Glass** | High Transmission Tempered Glass |
| **Frame** | Anodized Aluminum |

## Certifications and Warranty

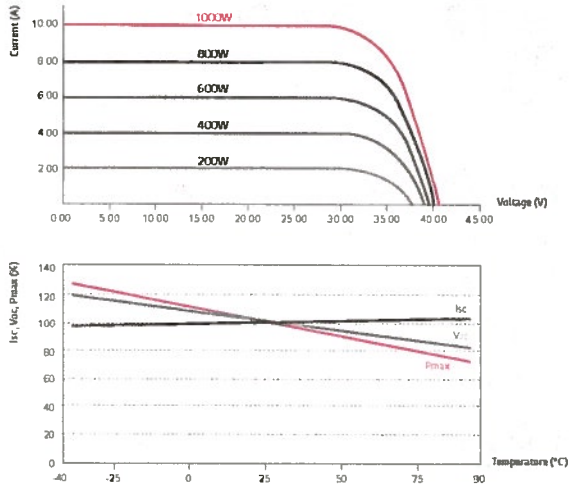
| | |
|---|---|
| **Certifications** | IEC 61215, IEC 61730-1/-2 |
| | IEC 62716 (Ammonia Test) |
| | IEC 61701 (Salt Mist Corrosion Test) |
| | ISO 9001 |
| | UL 1703 |
| **Module Fire Performance (USA)** | Type 2 (UL 1703) |
| **Fire Rating (for CANADA)** | Class C (ULC/ORD C1703) |
| **Product Warranty** | 12 years |
| **Output Warranty of Pmax** | Linear warranty* |

* 1) 1st year 98%, 2) After 2nd year 0.6%p annual degradation, 3) 83.6% for 25 years

## Temperature Characteristics

| | |
|---|---|
| **NOCT** | 46 ± 3 °C |
| **Pmpp** | -0.38 %/°C |
| **Voc** | -0.28 %/°C |
| **Isc** | 0.03 %/°C |

## Characteristic Curves




## Electrical Properties (STC *)

| | |
|---|---|
| **Module Type** | **315 W** |
| **MPP Voltage (Vmpp)** | 33.2 |
| **MPP Current (Impp)** | 9.50 |
| **Open Circuit Voltage (Voc)** | 40.6 |
| **Short Circuit Current (Isc)** | 10.02 |
| **Module Efficiency (%)** | 19.2 |
| **Operating Temperature (°C)** | -40 ~ +90 |
| **Maximum System Voltage (V)** | 1000 |
| **Maximum Series Fuse Rating (A)** | 20 |
| **Power Tolerance (%)** | 0 ~ +3 |

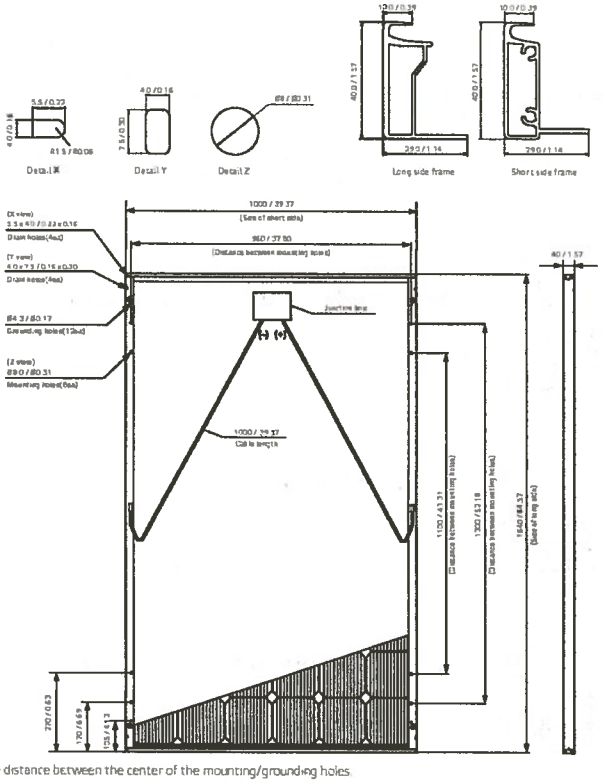
* STC (Standard Test Condition): Irradiance 1000 W/m², Module Temperature 25 °C, AM 1.5
* The nameplate power output is measured and determined by LG Electronics at its sole and absolute discretion
* **The typical change in module efficiency at 200 W/m² in relation to 1000 W/m² is -2.0%.**

## Electrical Properties (NOCT*)

| | |
|---|---|
| **Module Type** | **315 W** |
| **Maximum Power (Pmax)** | 230 |
| **MPP Voltage (Vmpp)** | 30.4 |
| **MPP Current (Impp)** | 7.58 |
| **Open Circuit Voltage (Voc)** | 37.6 |
| **Short Circuit Current (Isc)** | 8.08 |

* NOCT (Nominal Operating Cell Temperature): Irradiance 800 W/m², ambient temperature 20 °C, wind speed 1 m/s

## Dimensions (mm/in)




* The distance between the center of the mounting/grounding holes


LG Life's Good

North America Solar Business Team
LG Electronics U.S.A. Inc
1000 Sylvan Ave, Englewood Cliffs, NJ 07632

Contact: lg.solar@lge.com
www.lgsolarusa.com


Product specifications are subject to change without notice.
DS-N2-60-C-G-F-EN-50427


01/04/2015

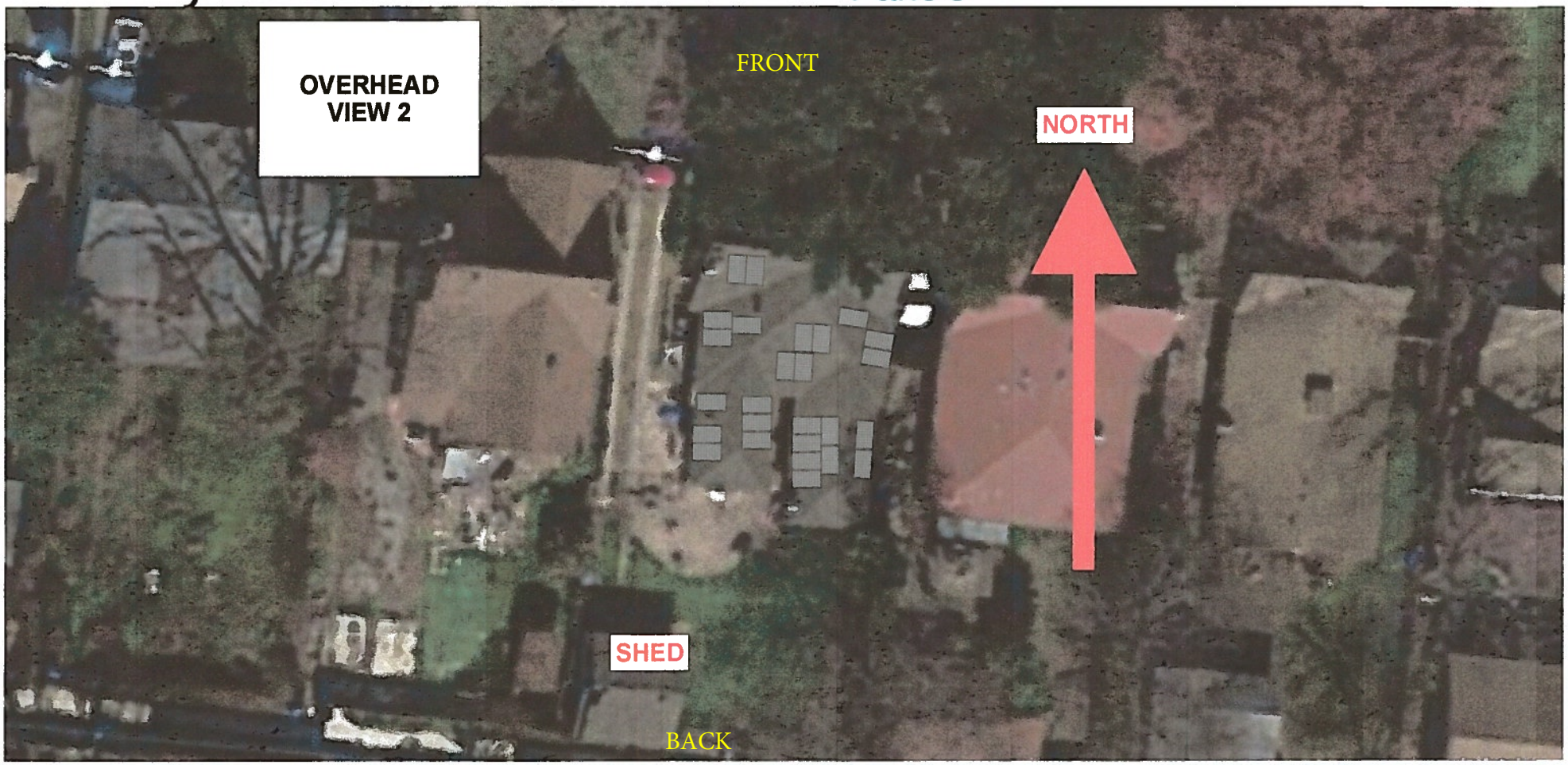
Innovation for a Better Life


OVERHEAD
VIEW 1
North Dr
North Dr
North Dr
North Dr
North Dr
North Dr
North Dr
114 North Dr
Google

Lawton Mike Smith
Sales Representative
10203 Kotzebue St, Suite 226
San Antonio, TX 78217

# Anthony Smith

26 Panels




114 North Drive
San Antonio, Tx 78201

www.txsolarsystems.com

FRONT


SHED

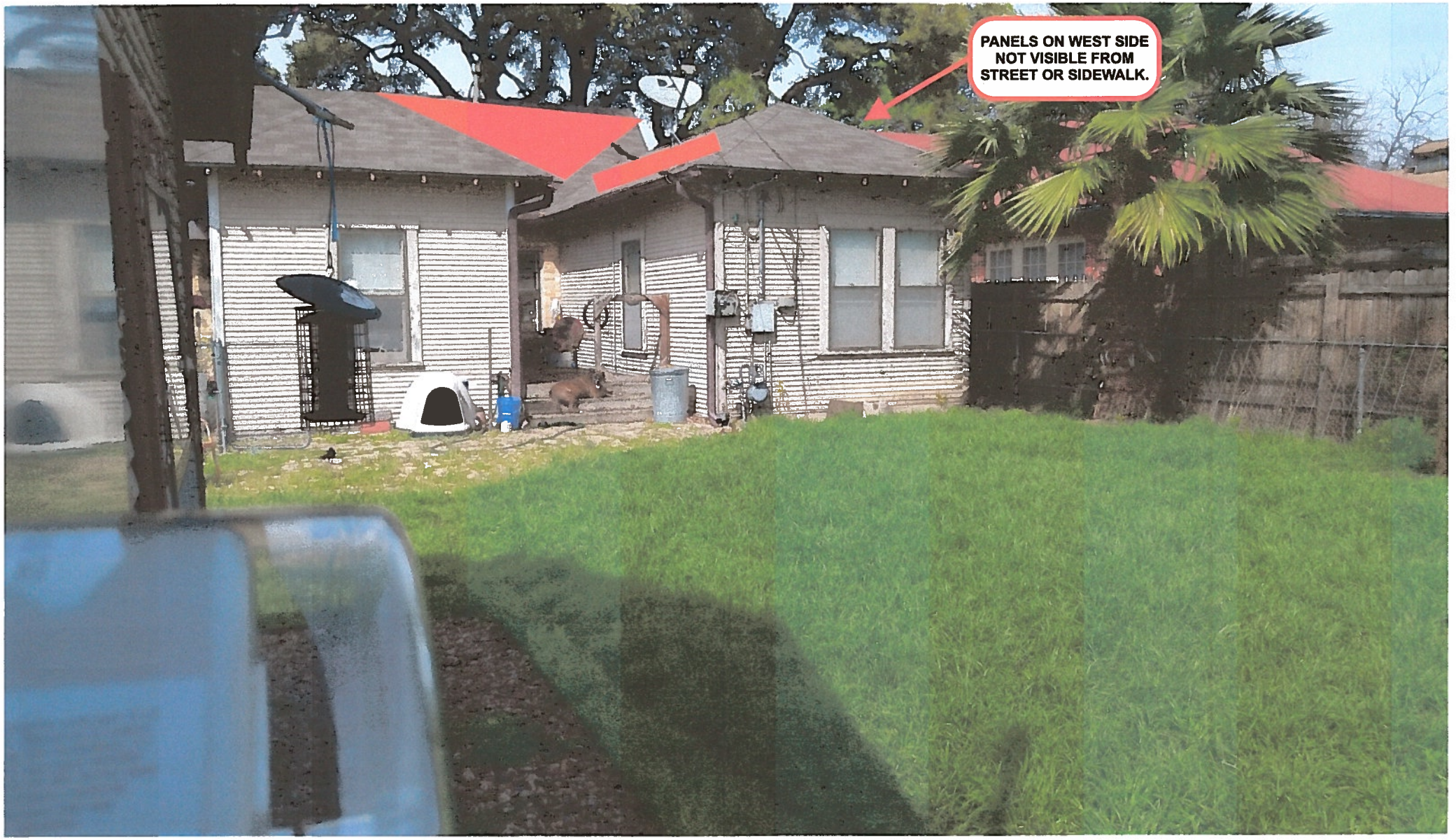
FRONT


PANELS LOCATED IN
BACK OF HOME.


PANELS LOCATED IN
BACK OF HOME.


PANLES LOCATED IN
BACK OF HOUSE.


PANLES LOCATED IN
BACK OF HOUSE.


PANELS ON WEST SIDE
NOT VISIBLE FROM
STREET OR SIDEWALK.


AC
DISC
SM
INVERTER

| System Information | | | | | |
|---|---|---|---|---|---|
| **PV Module Ratings** | | | **Inverter Ratings** | | |
| Module Make | | LG Solar | Inverter Make | | SolarEdge |
| Module Model | | LG315N1C-G4 | Inverter Model | | SE7600A-US |
| Max Power | = | 315 W | Max. Output Power | = | 8350 W |
| Open Circuit Voltage | = | 440.6 V | Max. DC Voltage | = | 500 V |
| Max Power Point Voltage | = | 33.2 V | Norminal AC Voltage | = | 240 V |
| Short Circuit Current | = | 10.02 A | Max. AC Current | = | 32 A |
| Max Power Point Current | = | 9.50 A | CEC Inverter Efficiency | = | 97.5% |

| Labels | | |
|---|---|---|
| **Photovoltaic DC Disconnect** | | |
| Rated MPP Current | = | 23.0 A |
| Rated MPP Voltage | = | 350.0 V |
| Max. System Voltage | = | 500.0 V |
| Max. System Current | = | 30.0 A |
| **Photovoltaic AC Disconnect** | | |
| AC Output Current | = | 32 A |
| Nominal AC Voltage | = | 240 V |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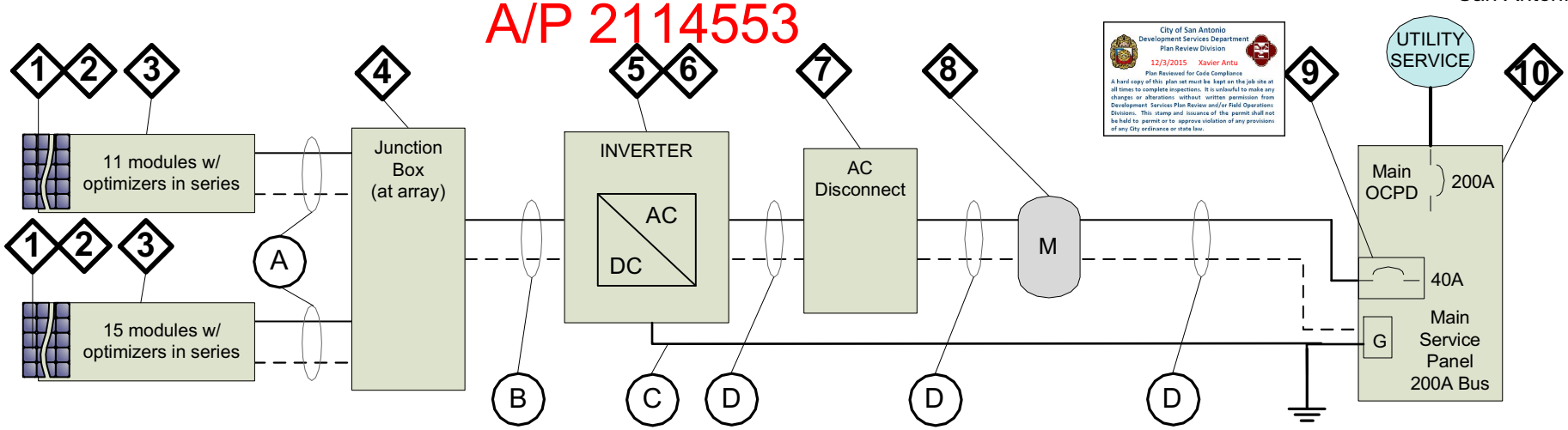


PV System meets requirements for Rapid Shutdown as defined in 690.12.

| EQUIPMENT SCHEDULE | | | |
|---|---|---|---|
| REF | DESCRIPTION | PN | NOTES |
| 1 | SOLAR PV MODULE | LG315N1C-G4 | LG SOLAR 315W MONOCRYSTALLINE MODULE |
| 2 | PV MODULE OPTIMIZER | P320 | SOLAREDGE 320W PV MODULE OPTIMIZER |
| 3 | ARRAY MOUNTING HARDWARE | TBD | FLUSH ROOF RACKING SYSTEM |
| 4 | JUNCTION BOX | SDS-P-3-DC | SAFE-D 3-CIRCUIT PASS-THRU BOX |
| 5 | AC/DC INVERTER | SE7600A-US | SOLAREDGE 7.6KW INVERTER W/ AC/DC DISCONNECT |
| 6 | WIRELESS COMM | SE1000-ZBGW | SOLAREDGE ZIGBEE WIRELESS COMMUNICATIONS |
| 7 | MAIN AC DISCONNECT | DU222NRB | SQUARE D, SAFETY SWITCH, 240V, 60A 2-POLE, UNFUSED |
| 8 | GENERATION METER | TBD | |
| 9 | MAIN SOLAR OCPD | TBD | 240V, 40A, 2-POLE CIRCUIT BREAKER (BACK-FED) |
| 10 | MAIN SERVICE PANEL | NA | 240V, 200A BUS & 200A MAIN BREAKER (PENDING UPGRADE) |

| CONDUIT & CONDUCTOR SCHEDULE | | | | | |
|---|---|---|---|---|---|
| REF | DESCRIP. /CONDUCTOR TYPE | CONDUCTOR GAUGE | NUMBER OF CONDUCTORS | CONDUIT TYPE | CONDUIT SIZE |
| A | PV-WIRE & BARE GROUND | #12 / #6 | 2 / 1 | | |
| B | THWN-2 | #10 / #6 | 4 / 1 | EMT | 1" |
| C | BARE GROUND | #6 | 1 | | |
| D | THWN-2 | #8 / #10 | 3 / 1 | EMT | 3/4" |

Notes:

- Equipment, conductors & conduit as listed or equivalent.
- Expected nominal string voltage: 350Vdc.
- Expected nominal optimizer output voltage: String of 11 – 31.8Vdc, String of 15 – 23.3Vdc

| ONE-LINE STANDARD ELECTRICAL DIAGRAM |
|---|
| PROJECT REF: Anthony Smith |
| SITE ADDRESS: 114 North Dr, San Antonio, TX 78201 |
| SYSTEM SIZE: 8.19 kW |
| 1 String of 11 & 1 String of 15 Modules/Optimizers (LG Solar 315W, SolarEdge P320) |

Sheet 1 of 9
Date: November 12, 2015

**NOT TO SCALE**

## SAN ANTONIO INTL AP

| Elev. | High Temp | | Distance above roof | | | Extreme |
|---|---|---|---|---|---|---|
| | 0.4% | 2% Avg. | 0.5" | 3.5" | 12" | Min |
| 247 m | 38 °C | 36 °C | 58 °C | 53 °C | 50 °C | -6 °C |

# A/P 2114553


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**Correction Temperatures**
$\Delta T_{cold}$ = -6°C – 25°C = -31°C  $\Delta T_{hot}$ = (36°C + 35°C) – 25°C = 46°C
Flush roof mount

**Module Voltage Calculations**
LG Neon 60 Cell 315W (LG315N1C-G4)
Voc = 40.6V  Vmp = 33.2V  Voc Temp Coefficient = -0.28%/°C
Isc = 10.02A  Imp = 9.50A  Pmax Temp Coefficient = -0.38%/°C

Cold Voc = 40.6V + (40.6V x -0.28%/°C x -31°C) = 40.6V + 3.52V = **44.1V**
Hot Vmp = 33.2V + (33.2V x -0.38%/°C x 46°C) = 33.2V – 5.80V = **27.4V**

SolarEdge P320 Optimizer  Maximum Power per String: 5250W
Max Input DC Power: 320W  Max Input DC Voltage: 48V
MPPT Operating Range: 8-48V  Max Input Isc Current: 11A
Maximum DC Output: 15A  Min/Max Input String Length: 8/25

**String Sizing**
11 x 315W = 3465W  15 x 315W = 4725W

SolarEdge SE7600A-US Inverter
Max DC Input (V): 500V  Max DC Input (A): 23.0A
Nominal DC Input: 350V
Output voltage: 240Vac  Max Output current: 32.0A

**Label Calculations**
MPPT DC Current:
315W x 26 ÷ 350V = 23.4A ← Limited to 23.0A by the Inverter

**Conductor Ampacity**
PV Source Circuit (Optimizer Output):
15A x 125% = 18.8A (continuous duty)
18.8A ÷ 1.00 = 18.8A (PV Wire in free air)
#12 AWG (rated for 35A into 75° terminals in free air)
18.8A ÷ 0.71 ÷ 0.8 = 33.1A (conditions of use – temp and conduit fill)
#10 AWG (rated for 35A into 75° terminals and required OCPD)

Inverter Output Circuit:
32.0A x 125% = 40.0A
#8 AWG (rated for 50A into 75° terminals and required OCPD)

**OCPD & Disconnects**
*DC fusing not required. Each string lands on a separate set of terminals in the inverter and there are only two strings.*

*DC/AC Disconnect functions integral to inverter.*

Inverter OCPD and Disconnect:
32.0A x 125% = 40.0A → 40A Back-Fed Circuit Breaker
60A, 2-Pole, 240V Unfused Disconnect

**Voltage Drop calculations**
Worst case combination of distance and amperage:
PV Nominal String Voltage: 350Vdc
PV MPPT String Current: 315W x 11 ÷ 350V = 9.9A
DC conductor run is 50 ft (estimated)
DC Voltage Drop
(2 x 50ft x 9.9A x 1.24Ω/kft x 100) / (1000ft/kft x 350V) = 0.35%

Inverter Output is 240Vac, 32A
AC conductor run is 15 ft (estimated)
AC Voltage Drop
(2 x 15ft x 32.0A x 0.778Ω/kft x 100) / (1000ft/kft x 240V) = 0.31%

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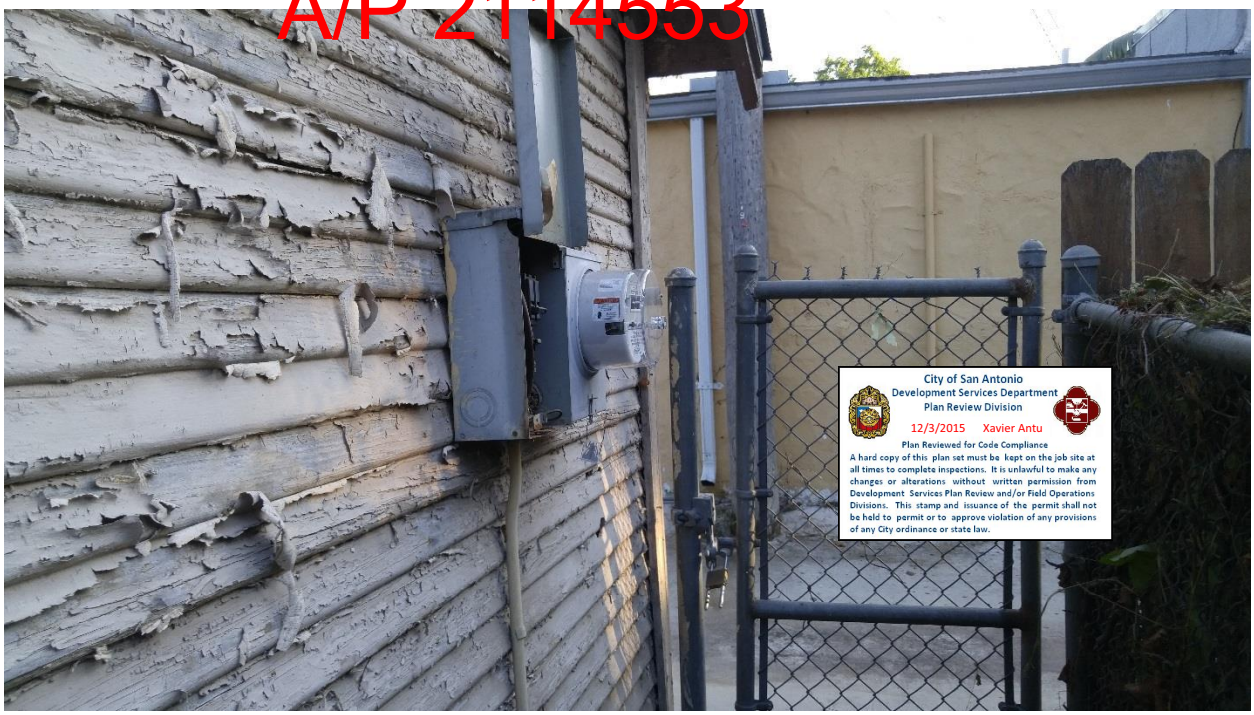
12/3/2015 Xavier Antu
Plan Reviewed for Code Compliance
A hard copy of this plan set must be kept on the job site at all times to complete inspections. It is unlawful to make any changes or alterations without written permission from Development Services Plan Review and/or Field Operations Divisions. This stamp and issuance of the permit shall not be held to permit or to approve violation of any provisions of any City ordinance or state law.

## Module string assignments:

- String of 16 – all modules from sub-arrays 1, 2 and 3.
- String of 11 – all modules from sub-arrays 4, 5 and 6.

| ELECTRICAL CALCULATIONS |
|---|
| PROJECT REF: Anthony Smith |
| SITE ADDRESS: 114 North Dr, San Antonio, TX 78201 |
| SYSTEM SIZE: 8.19 kW |
| 1 String of 11 & 1 String of 15 Modules/Optimizers (LG Solar 315W, SolarEdge P320) |

A/P 2114553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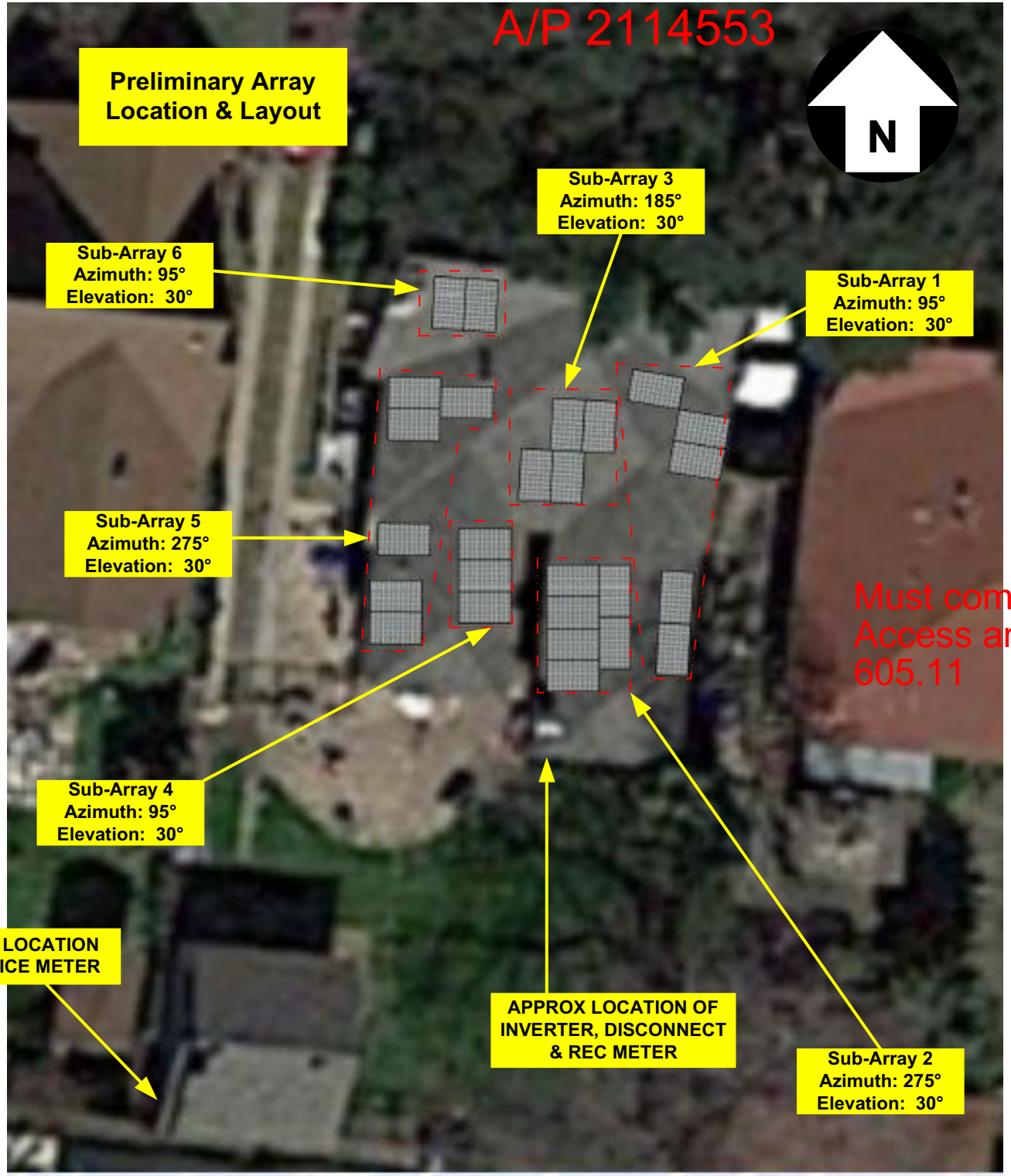
inv ert er
Ac disc onn ect
SM
New Panel
FOCUS
CPS ENERGY 6 113 415
129 313 485

A/P 2114553





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Must comply with 2015 IFC Access and Pathways 605.11

| ARRAY LAYOUT |
|---|
| PROJECT REF: Anthony Smith |
| SITE ADDRESS: 114 North Dr, San Antonio, TX 78201 |
| SYSTEM SIZE: 8.19 kW |
| 1 String of 11 & 1 String of 15 Modules/Optimizers (LG Solar 315W, SolarEdge P320) |

## Notes:

- PV System meets requirements for Rapid Shutdown as defined in 690.12.
- Each PV module is connected to a dedicated optimizer. The voltage generated by a string of modules/optimizers is controlled to 350Vdc at the inverter DC inputs.
- Calculations for the System Labeling based on SolarEdge Tech Note, *PV Power Source Labeling in a SolarEdge system*.
- Inverter, REC meter and AC Disconnect tentatively located near the Southeast corner of the residence. Location may be adjusted. Service entrance located on the outbuilding at the Southwest corner of the property. A plaque identifying the location of each power source may be required at each source.
- Ensure clearances around the inverter comply with Chapter 3 of the Solar Edge Installation Guide. The inverter should be installed to minimize exposure to sunlight, rainfall and direct water spray.
- Each module/optimizer string is run to a separate input on the inverter.
- Interconnection to the main service via a back-fed breaker in the main service panel. Complies with 705.12.
- Main Service Panel to be upgraded to 200A bus with 200A main breaker.
- Layout/location of array may be adjusted to avoid vent stacks, skylights and other roof protrusions. Adequate clearances should be maintained from roof eaves and ridge to allow for safe access. Minimum spacing between module rows should be 1/4 inch to allow for thermal expansion of module frames.
- Conductor sizing listed is minimum required based on NEC ampacity calculations for CU conductors and a conduit fill of not more than 4 current carrying conductors. Minimum conductor size required for REC meter base typically #6 AWG.
- DC Conductors must be rated for a minimum of 600V
- Conduit sizing is based upon NABCEP recommended maximum conduit fill of 25%. Conduit sizing may be decreased to comply with Annex C of NEC.
- Voltage drop calculations should be verified on-site based on actual wire run lengths. Recommended worst case system voltage drop – 2% total.
- All electrical work must be made in accordance with the local and applicable *National Electrical Code* ANSI/NFPA 70.
- PV System to be installed and labeled per National Electric Code 2014. Specifically:
  - 690.4(B)(1),(2) and (3)
  - 690.4(H)
  - 690.5
  - 690.17
  - 690.31
  - 690.35(C) and (F)
- Inverter listed to UL-1741 for grid-interactive use and GFDI protection.
- All equipment used UL listed.
- Equipment, conductors and conduit as listed or equivalent.

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10203 Kotzebue St
Suite 226
San Antonio, TX 78217

| SPECIAL NOTES |
|---|
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Date: November 12, 2015

# A/P 2114553


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LG Life's Good

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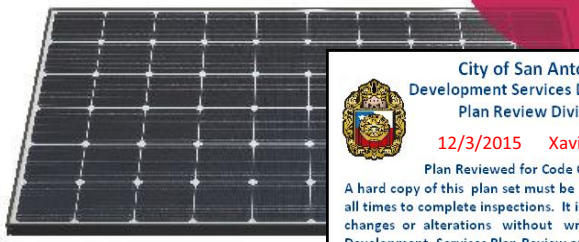

LG NeON 2 LG315N1C-G4

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Plan Reviewed for Code Compliance

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### Aesthetic Roof

LG NeON™ 2 has been designed with aesthetics in mind; thinner wires that appear all black at a distance. The product may help increase the value of a property with its modern design.

### Better Performance on a Sunny Day

LG NeON™ 2 now performs better on sunny days thanks to its improved temperature coefficient.

### High Power Output

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### Double-Sided Cell Structure

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About LG Electronics

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## LG NeON 2 LG315N1C-G4

### Mechanical Properties

| | |
|---|---|
| Cells | 6 x 10 |
| Cell Vendor | LG |
| Cell Type | Monocrystalline / N-type |
| Cell Dimensions | 156.75 x 156.75 mm / 6 inches |
| # of Busbar | 12 (Multi Wire Busbar) |
| Dimensions (L x W x H) | 1640 x 1000 x 40 mm<br>64.57 x 39.37 x 1.57 inch |
| Front Load | 6000 Pa / 125 psf |
| Rear Load | 5400 Pa / 113 psf |
| Weight | 17.0 ± 0.5 kg / 37.48 ± 1.1 lbs |
| Connector Type | MC4, MC4 Compatible, IP67 |
| Junction Box | IP67 with 3 Bypass Diodes |
| Length of Cables | 2 x 1000 mm / 2 x 39.37 inch |
| Glass | High Transmission Tempered Glass |
| Frame | Anodized Aluminum |

### Certifications and Warranty

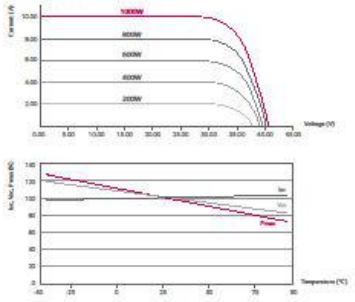
| | |
|---|---|
| Certifications | IEC 61215, IEC 61730-1/-2 |
| | IEC 62716 (Ammonia Test) |
| | IEC 61701 (Salt Mist Corrosion Test) |
| | ISO 9001 |
| | UL 1703 |
| Module Fire Performance (USA) | Type 2 (UL 1703) |
| Fire Rating (for CANADA) | Class C (ULC/ORD C1703) |
| Product Warranty | 12 years |
| Output Warranty of Pmax | Linear warranty* |

* 1) 1st year: 98%, 2) After 2nd year: 0.8% annual degradation, 3) 83.6% for 25 years

### Temperature Characteristics

| | |
|---|---|
| NOCT | 46 ± 3 °C |
| Pmpp | -0.38 %/°C |
| Voc | -0.28 %/°C |
| Isc | 0.03 %/°C |

### Characteristic Curves




### Electrical Properties (STC *)

| | |
|---|---|
| Module Type | 315 W |
| MPP Voltage (Vmpp) | 33.2 |
| MPP Current (Impp) | 9.50 |
| Open Circuit Voltage (Voc) | 40.6 |
| Short Circuit Current (Isc) | 10.02 |
| Module Efficiency (%) | 19.2 |
| Operating Temperature (°C) | -40 ~ +90 |
| Maximum System Voltage (V) | 1000 |
| Maximum Series Fuse Rating (A) | 20 |
| Power Tolerance (%) | 0 ~ +3 |

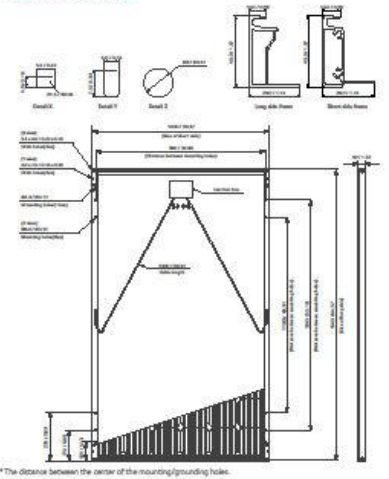
* STC (Standard Test Condition): Irradiance 1000 W/m², Module Temperature 25 °C, AM 1.5
* The nameplate power output is measured and determined by LG Electronics at its sole and absolute discretion.
** The typical low-light performance of this module is 98% (reference: 200 W/m² in relation to 1000 W/m²).

### Electrical Properties (NOCT*)

| | |
|---|---|
| Module Type | 315 W |
| Maximum Power (Pmax) | 230 |
| MPP Voltage (Vmpp) | 30.4 |
| MPP Current (Impp) | 7.58 |
| Open Circuit Voltage (Voc) | 37.6 |
| Short Circuit Current (Isc) | 8.08 |

* NOCT (Nominal Operating Cell Temperature): Irradiance 800 W/m², ambient temperature 20 °C, wind speed 1 m/s

### Dimensions (mm/in)



* The distance between the center of the mounting/grounding holes.


LG Life's Good

North America Solar Business Team
LG Electronics U.S.A. Inc.
1000 Sylvan Ave, Englewood Cliffs, NJ 07632

Contact: lg.solar@lge.com
www.lgsolarusa.com




| SPECIFICATIONS |
|---|
| PROJECT REF: Anthony Smith |
| SITE ADDRESS: 114 North Dr, San Antonio, TX 78201 |
| SYSTEM SIZE: 8.19 kW |
| 1 String of 11 & 1 String of 15 Modules/Optimizers (LG Solar 315W, SolarEdge P320) |

# A/P 2114553

SOUTH TEXAS SOLAR SYSTEMS INC.
10203 Kotzebue St
Suite 226
San Antonio, TX 78217

solaredge

## SolarEdge Single Phase Inverters
For North America

SE3000A-US / SE3800A-US / SE5000A-US / SE6000A-US /
SE7600A-US / SE10000A-US / SE11400A-US

INVERTERS

**The best choice for SolarEdge enabled systems**

- Integrated arc fault protection (Type 1) for NEC 2011 690.11 compliance
- Superior efficiency (98%)
- Small, lightweight and easy to install on provided bracket
- Built-in module-level monitoring
- Internet connection through Ethernet or Wireless
- Outdoor and indoor installation
- Fixed voltage inverter, DC/AC conversion only
- Pre-assembled Safety Switch for faster installation
- Optional – revenue grade data, ANSI C12.1

USA - GERMANY - ITALY - FRANCE - JAPAN - CHINA - AUSTRALIA - THE NETHERLANDS - ISRAEL

www.solaredge.us

City of San Antonio
Development Services Department
Plan Review Division

12/3/2015 Xavier Antu

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solaredge **Single Phase Inverters** for North America

SE3000A-US / SE3800A-US / SE5000A-US / SE6000A-US /
SE7600A-US / SE10000A-US / SE11400A-US

| | SE3000A-US | SE3800A-US | SE5000A-US | SE6000A-US | SE7600A-US | SE10000A-US | SE11400A-US | |
|---|---|---|---|---|---|---|---|---|
| **OUTPUT** | | | | | | | | |
| Nominal AC Power Output | 3000 | 3800 | 5000 | 6000 | 7600 | 9980 @ 208V<br>10000 @240V | 11400 | VA |
| Max. AC Power Output | 3300 | 4150 | 5400 @ 208V<br>5450 @240V | 6000 | 8350 | 10800 @ 208V<br>10950 @240V | 12000 | VA |
| AC Output Voltage Min.-Nom.-Max.[3] 183 - 208 - 229 Vac | - | - | ✓ | - | - | ✓ | - | |
| AC Output Voltage Min.-Nom.-Max.[3] 211 - 240 - 264 Vac | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| AC Frequency Min.-Nom.-Max.[3] | 59.3 - 60 - 60.5 (with HI country setting 57 - 60 - 60.5) | | | | | | | Hz |
| Max. Continuous Output Current | 12.5 | 16 | 24 @ 208V<br>21 @ 240V | 25 | 32 | 48 @ 208V<br>42 @ 240V | 47.5 | A |
| GFDI Threshold | 1 | | | | | | | A |
| Utility Monitoring, Islanding Protection, Country Configurable Thresholds | Yes | | | | | | | Yes |
| **INPUT** | | | | | | | | |
| Maximum DC Power (STC) | 4050 | 5100 | 6750 | 8100 | 10250 | 13500 | 15350 | W |
| Transformer-less, Ungrounded | Yes | | | | | | | |
| | 500 | | | | | | | Vdc |
| | 325 @ 208V / 350 @ 240V | | | | | | | Vdc |
| | 9.5 | 13 | 16.5 @ 208V<br>15.5 @ 240V | 18 | 23 | 33 @ 208V<br>30.5 @ 240V | 34.5 | Adc |
| t Current | 45 | | | | | | | Adc |
| ction | Yes | | | | | | | |
| Detection | 600kg Sensitivity | | | | | | | |
| ciency | 97.7 | 98.2 | 98.3 | 98.3 | 98 | 98 | 98 | % |
| y | 97.5 | 98 | 97.5 @ 208V<br>98 @ 240V | 97.5 | 97.5 | 97 @ 208V<br>97.5 @ 240V | 97.5 | % |
| umption | < 2.5 | | | | | < 4 | | W |
| **RES** | | | | | | | | |
| tion Interfaces | RS485, RS232, Ethernet, ZigBee (optional) | | | | | | | |
| NSI C12.1 | Optional[6] | | | | | | | |
| 2014 690.12 | Functionality enabled when SolarEdge rapid shutdown kit is installed[4] | | | | | | | |
| **ANCE** | | | | | | | | |
| | UL1741, UL16998, UL1998 , CSA 22.2 | | | | | | | |
| ards | IEEE1547 | | | | | | | |
| | FCC part15 class B | | | | | | | |
| **IFICATIONS** | | | | | | | | |
| / AWG range | 3/4" minimum / 16-6 AWG | | | | | 3/4" minimum / 8-3 AWG | | |
| DC input conduit size / # of strings / AWG range | 3/4" minimum / 1-2 strings / 16-6 AWG | | | | | 3/4" minimum / 1-2 strings / 14-6 AWG | | |
| Dimensions with Safety Switch (HxWxD) | 30.5 x 12.5 x 7.2 / 775 x 315 x 184 | | | | | 30.5 x 12.5 x 10.5 / 775 x 315 x 260 | | in / mm |
| Weight with Safety Switch | 51.2 / 23.2 | | 54.7 / 24.7 | | | 88.4 / 40.1 | | lb / kg |
| Cooling | Natural Convection | | | | Natural convection and internal fan (user replaceable) | Fans (user replaceable) | | |
| Noise | < 25 | | | | | < 50 | | dBA |
| Min.-Max. Operating Temperature Range | -13 to +140 / -25 to +60 (-40 to +60 version available[7]) | | | | | | | °F / °C |
| Protection Rating | NEMA 3R | | | | | | | |

[3] For other regional settings please contact SolarEdge support.
[4] A higher current source may be used; the inverter will limit its input current to the values stated.
[5] Revenue grade inverter P/N: SExxxxA-US000NNR2 (for 7600W inverter:SE7600A-US002NNR2).
[6] Rapid shutdown kit P/N: SE1000-RSD-S1.
[7] -40 version P/N: SExxxxA-US000NNU4 (for 7600W inverter:SE7600A-US002NNU4).

RoHS



| SPECIFICATIONS |
|---|
| PROJECT REF: Anthony Smith |
| SITE ADDRESS: 114 North Dr, San Antonio, TX 78201 |
| SYSTEM SIZE: 8.19 kW |
| 1 String of 11 & 1 String of 15 Modules/Optimizers (LG Solar 315W, SolarEdge P320) |

Sheet 6 of 9
Date: November 12, 2015

# A/P 2114553

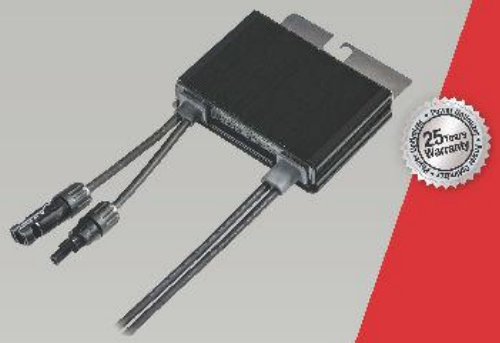
SOUTH TEXAS SOLAR SYSTEMS INC.
10203 Kotzebue St
Suite 226
San Antonio, TX 78217

solaredge

## SolarEdge Power Optimizer

Module Add-On For North America

P300 / P320 / P400 / P405



City of San Antonio
Development Services Department
Plan Review Division

12/3/2015 Xavier Antu

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### PV power optimization at the module-level

- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Module-level voltage shutdown for installer and firefighter safety

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www.solaredge.us

solaredge

## SolarEdge Power Optimizer

Module Add-On for North America

P300 / P320 / P400 / P405

| | P300 (for 60-cell modules) | P320 (for high-power 60-cell modules) | P400 (for 72 & 96-cell modules) | P405 (for thin film modules) | |
|---|---|---|---|---|---|
| **INPUT** | | | | | |
| Rated Input DC Power(1) | 300 | 320 | 400 | 405 | W |
| Maximum Input Voltage (west temperature) | 48 | | 80 | 125 | Vdc |
| erating Range | 8 - 48 | | 8 - 80 | 12.5 - 105 | Vdc |
| Short Circuit Current (Isc) | 10 | 11 | 10 | | Adc |
| DC Input Current | 12.5 | 13.75 | 12.5 | | Adc |
| Efficiency | 99.5 | | | | % |
| Efficiency | 98.8 | | | | % |
| ge Category | II | | | | |
| **DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)** | | | | | |
| Output Current | 15 | | | | Adc |
| Output Voltage | 60 | | | 85 | Vdc |
| **DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)** | | | | | |
| tput Voltage per Power | 1 | | | | Vdc |
| **D COMPLIANCE** | | | | | |
| EMC | FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3 | | | | |
| Safety | IEC62109-1 (class II safety), UL1741 | | | | |
| RoHS | Yes | | | | |
| **INSTALLATION SPECIFICATIONS** | | | | | |
| Maximum Allowed System Voltage | 1000 | | | | Vdc |
| Compatible inverters | All SolarEdge Single Phase and Three Phase inverters | | | | |
| Dimensions (W x L x H) | 128 x 152 x 27.5 / 5 x 5.97 x 1.08 | | 128 x 152 x 35 / 5 x 5.97 x 1.37 | 128 x 152 x 48 / 5 x 5.97 x 1.89 | mm / in |
| Weight (including cables) | 770 / 1.7 | | 930 / 2.05 | 930 / 2.05 | gr / lb |
| Input Connector | MC4 Compatible | | | | |
| Output Wire Type / Connector | Double Insulated; MC4 Compatible | | | | |
| Output Wire Length | 0.95 / 3.0 | | | 1.2 / 3.9 | m / ft |
| Operating Temperature Range | -40 - +85 / -40 - +185 | | | | °C / °F |
| Protection Rating | IP68 / NEMA6P | | | | |
| Relative Humidity | 0 - 100 | | | | % |

(1) Rated STC power of the module. Module of up to +5% power tolerance allowed.

| PV SYSTEM DESIGN USING A SOLAREDGE INVERTER(2) | SINGLE PHASE | THREE PHASE 208V | THREE PHASE 480V | |
|---|---|---|---|---|
| Minimum String Length (Power Optimizers) | 8 | 10 | 18 | |
| Maximum String Length (Power Optimizers) | 25 | 25 | 50 | |
| Maximum Power per String | 5250 | 6000 | 12750 | W |
| Parallel Strings of Different Lengths or Orientations | Yes | | | |

(2) It is not allowed to mix P405 with P300/P400/P600/P700 in one string.

CE



| SPECIFICATIONS |
|---|
| PROJECT REF: Anthony Smith |
| SITE ADDRESS: 114 North Dr, San Antonio, TX 78201 |
| SYSTEM SIZE: 8.19 kW |
| 1 String of 11 & 1 String of 15 Modules/Optimizers (LG Solar 315W, SolarEdge P320) |

Sheet 7 of 9
Date: November 12, 2015

solaredge

**Project:**

Anthony Smith
Thursday, November 12, 2015 10:42 AM
114 North Drive
San Antonio, TX 78201

San Antonio Intl for weather

A/P 2114553

**Location:**

San Antonio, Texas, United States

**System data:**

Installed power: 8.19 kWp
Max achieved DC power: 7.50 kW
Inverter active power: 7.60 kW
Maximum apparent power: 7.60 kVA

City of San Antonio
Development Services Department
Plan Review Division
12/3/2015 Xavier Antu
Plan Reviewed for Code Compliance
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**PV Array # 1: PV Array # 1**

| Tilt | Azimuth | Mounting |
|---|---|---|
| 30° | 95° | Co-planar with roof |

LG Solar, LG315N1C-G4 (corrected), 315.00 W

**PV Array # 2: PV Array # 2**

| Tilt | Azimuth | Mounting |
|---|---|---|
| 30° | 275° | Co-planar with roof |

LG Solar, LG315N1C-G4 (corrected), 315.00 W

**PV Array # 3: PV Array # 3**

| Tilt | Azimuth | Mounting |
|---|---|---|
| 30° | 185° | Co-planar with roof |

LG Solar, LG315N1C-G4 (corrected), 315.00 W

**PV Array # 4: PV Array # 4**

| Tilt | Azimuth | Mounting |
|---|---|---|
| 30° | 95° | Co-planar with roof |

LG Solar, LG315N1C-G4 (corrected), 315.00 W

**PV Array # 5: PV Array # 5**

| Tilt | Azimuth | Mounting |
|---|---|---|
| 30° | 275° | Co-planar with roof |

LG Solar, LG315N1C-G4 (corrected), 315.00 W

**PV Array # 6: PV Array # 6**

| Tilt | Azimuth | Mounting |
|---|---|---|
| 30° | 185° | Co-planar with roof |

LG Solar, LG315N1C-G4 (corrected), 315.00 W

SOUTH TEXAS SOLAR SYSTEMS INC.
10203 Kotzebue St
Suite 226
San Antonio, TX 78217

| STRING SIZING TOOL REPORT |
|---|
| PROJECT REF: Anthony Smith |
| SITE ADDRESS: 114 North Dr, San Antonio, TX 78201 |
| SYSTEM SIZE: 8.19 kW |
| 1 String of 11 & 1 String of 15 Modules/Optimizers (LG Solar 315W, SolarEdge P320) |

solaredge

## Inverter design

Inverter 1: SE7600A-US

| | |
|---|---|
| String 1: | PV Array # 1: 5 x P320 |
| | PV Array # 2: 6 x P320 |
| | PV Array # 3: 4 x P320 |
| String 2: | PV Array # 4: 3 x P320 |
| | PV Array # 5: 6 x P320 |
| | PV Array # 6: 2 x P320 |

A/P 2114553

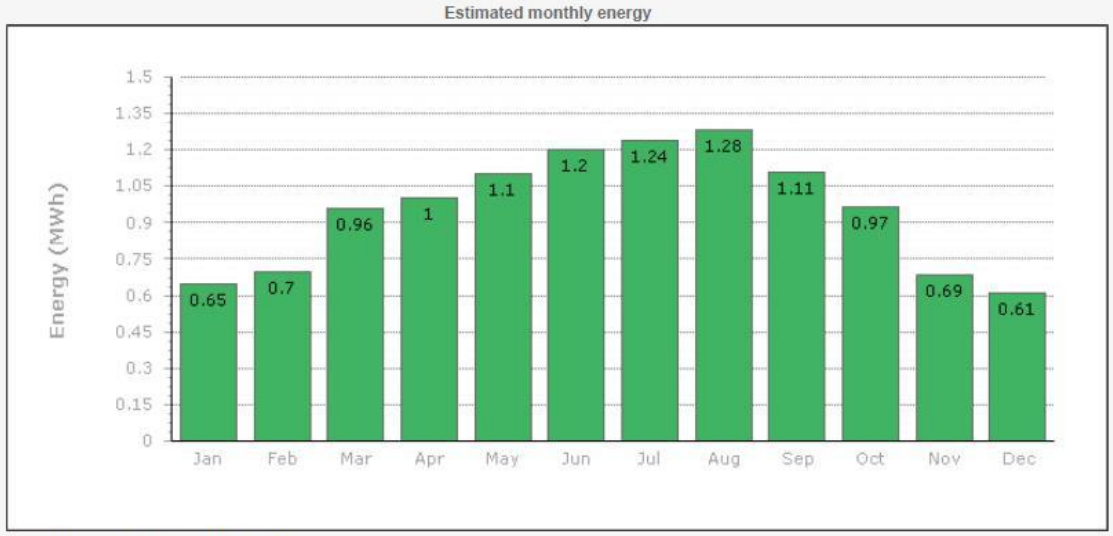
## Power optimizer extreme operating conditions

P320

| | Calculated | Limit | |
|---|---|---|---|
| Max input power | 315 W | 320 W | ✓ |
| Min input voltage | 35 V | 8 V | ✓ |
| Max input voltage | 44 V | 48 V | ✓ |
| Max input current | 10 A | 11 A | ✓ |
| Max output current | 12 A | 15 A | ✓ |

* Calculated values are the absolute min/max of all arrays using this power optimizer configuration.

## Energy estimation




Estimated yearly energy: 11.502 MWh

Energy yields are an approximation; they are not guaranteed by SolarEdge.

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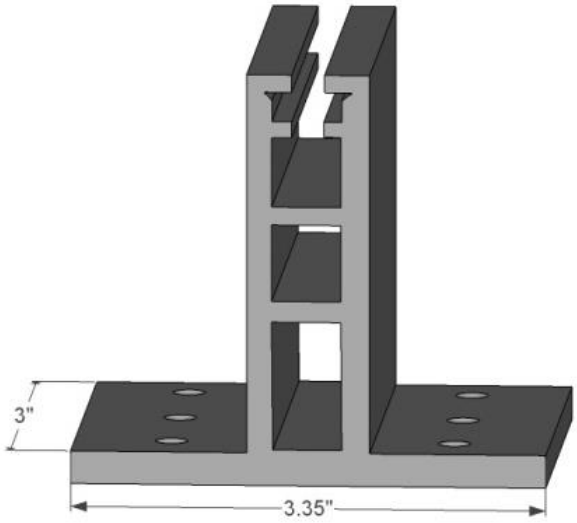
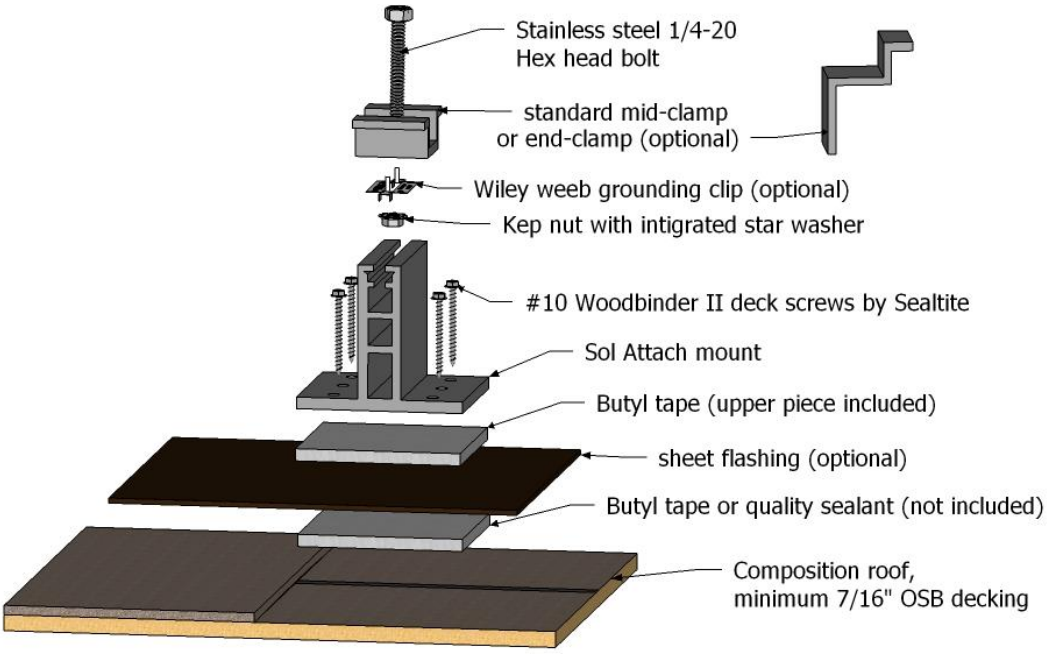
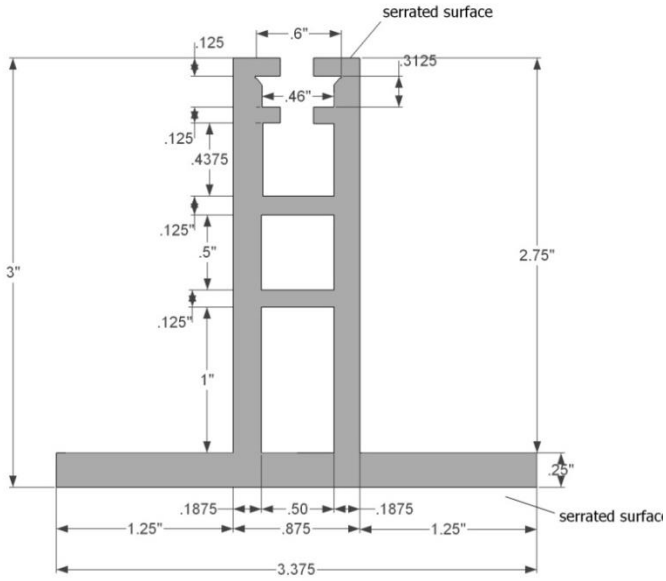
10203 Kotzebue St
Suite 226
San Antonio, TX 78217


| STRING SIZING TOOL REPORT |
|---|
| PROJECT REF: Anthony Smith |
| SITE ADDRESS: 114 North Dr, San Antonio, TX 78201 |
| SYSTEM SIZE: 8.19 kW |
| 1 String of 11 & 1 String of 15 Modules/Optimizers (LG Solar 315W, SolarEdge P320) |

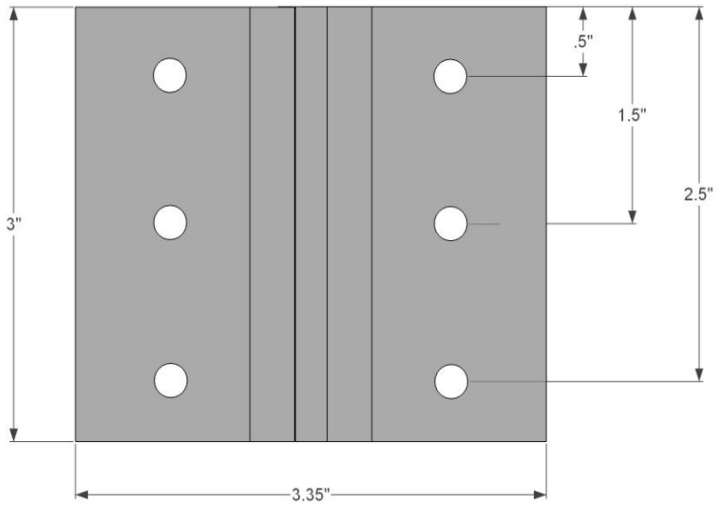
Sol Attach, LLC
**Composition roof mounting foot**
Extrusions made of 6061-T6 alloy
Patent Pending



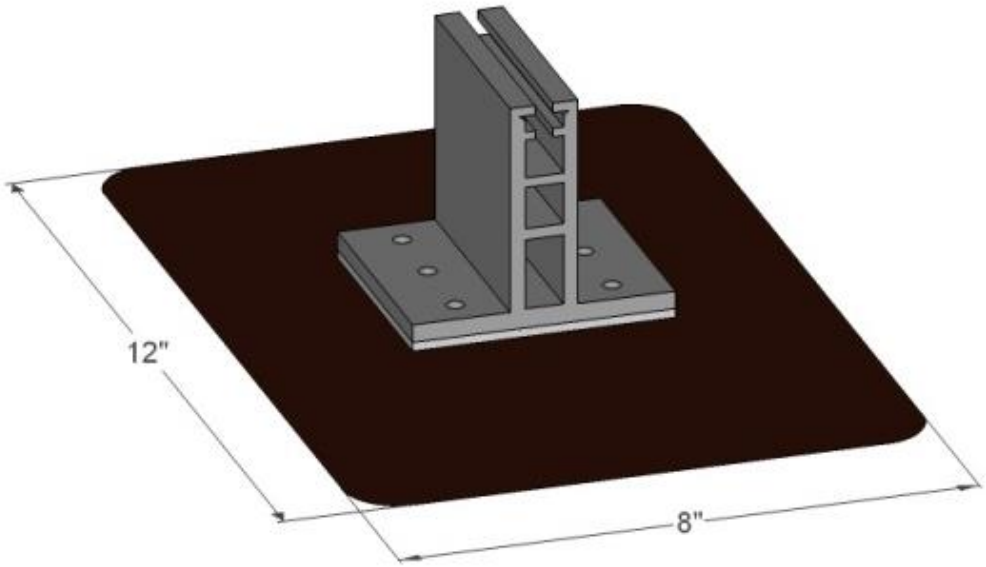



**Front View**




**Top View**

## Flat flashing



# String Combiners in SolarEdge Systems, North America

## Introduction

In a SolarEdge system, the PV modules are isolated from the DC output circuit by the power optimizer. There is no risk of exceeding the PV module maximum fuse rating current as a result of a fault in the DC output circuit. The inverter has been verified to contribute zero current to a faulted DC output circuit. The only sources of current to consider are the DC output circuits. A faulted string could be subjected to the combined currents of the other connected strings, which is 15 amps x N-1, where N is the number of strings. For 3 strings or less, the maximum combined current is 30 amps, which does not exceed the current rating of the power optimizer output cables and of the 10 gauge 90°C output circuit conductors. Some jurisdictions will require fused string combiners for systems with 3 strings.

For PV systems using the SolarEdge SE3000A-US through the SE7600A-US single phase inverters, and systems using the SE9kUS, SE10kUS, and SE20kUS three phase inverters, it is possible to fully load the inverters with a DC to AC ratio of 125%, with 2 strings or less. There are 2 scenarios where a third string would be required.

1. The SE10000A-US or the SE11400A-US single phase inverter with more than 10500 watts STC.
2. The SE20kUS three phase inverter with more than 25000 watts STC

A PV system with more than 2 strings connected in parallel should be evaluated to ensure that available current sources do not exceed the current rating of any conductors or components in a fault condition. The purpose of this Application Note is to provide guidelines for selecting fused string combiners when required.

## NEC Requirements

NEC article 690.9 outlines the overcurrent protection requirements for photovoltaic source circuits. The intent is to provide overcurrent protection for circuits connected to more than one electrical source. All sources of current need to be considered: multiple series strings of PV modules connected in parallel to the inverter as well as the string inverter itself. SolarEdge inverters have been verified to provide zero backfeed current to the input source circuits.

When overcurrent protection is required, NEC Article 240.15 states that an overcurrent protection device shall be connected in series with each ungrounded conductor.

Applicability to SolarEdge systems

SolarEdge inverters are non-isolated or transformer-less, so they must operate with ungrounded photovoltaic source and output circuits.

A string combiner for a SolarEdge system would require fusing in both the positive and negative conductors.

The SolarEdge optimizers limit current in DC output circuits to 15 amps per string. Using the NEC correction factor of 1.25, results in a string current of 15 amps x 1.25 = 18.75 amps. Therefore an individual string fuse rating of 20 amps is needed.

**SolarEdge Technologies | www.solaredge.com**

| | |
|---|---|
| **USA** | 3347 Gateway Boulevard, Fremont, CA, 94538 |
| **Germany** | Werner-Eckert-Straße 6, Munich 81829 |
| **Italy** | VISMUNDA SRL, Corso Del Popolo 50/A, Treviso |
| **Japan** | B-9 Ariake Frontier Building, 3-7-26 Ariake, Koto-Ku, Tokyo 135-0063 |
| **Israel** | 6 HeHarash St. P.O.Box 7349, Neve Neeman, Hod Hasharon 45240 |
| **China** | City Center, 100 Zunyi Road, Building A, Unit 1204, Shanghai 200051 |

## SolarEdge Power Optimizers

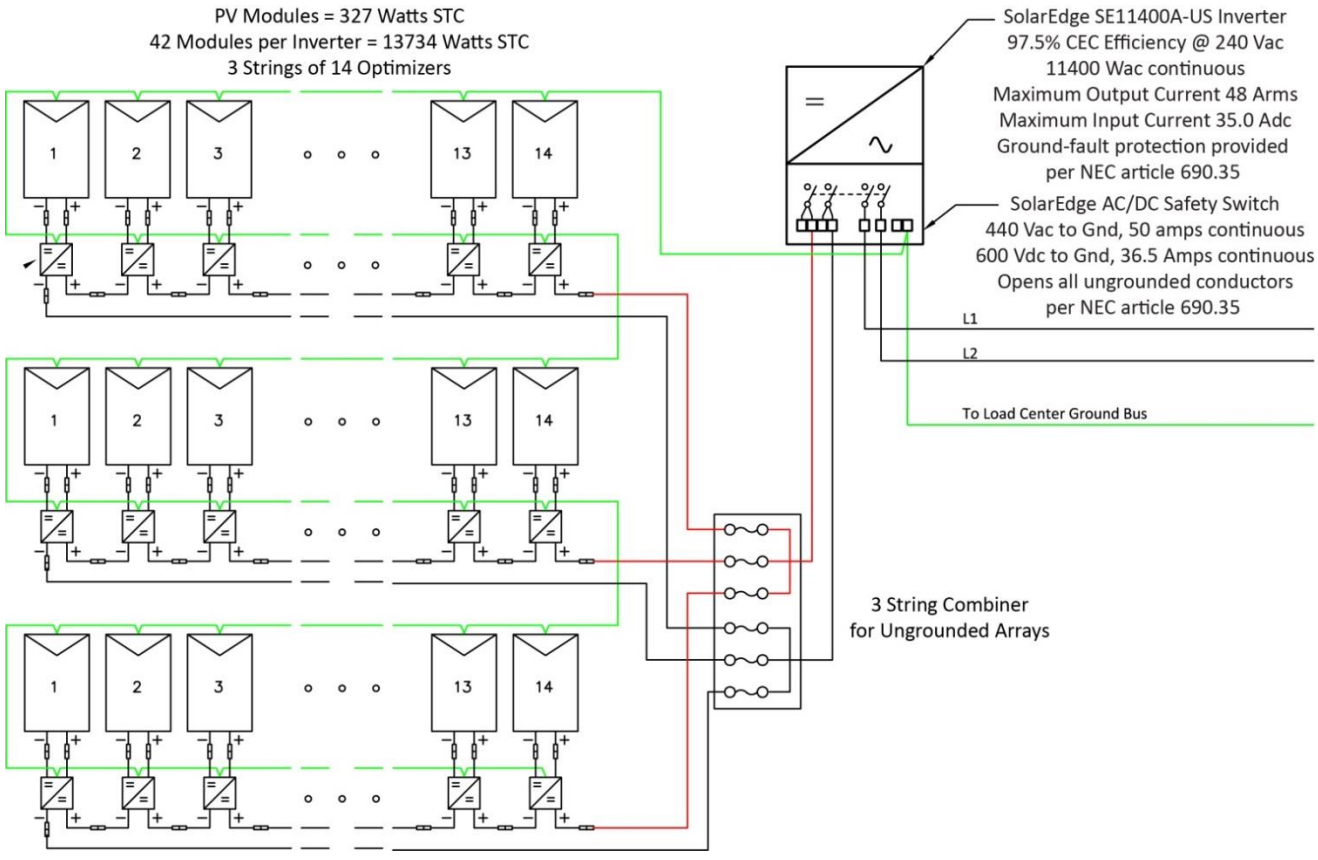
SolarEdge power optimizers provide internal current limitation as described in NEC article 690.8(B)(2). The power optimizers limit current at the optimizer DC output circuit to 15 amps. The maximum current value of 15 amps x the NEC correction factor of 1.25 should be used to determine DC output circuit conductor size and overcurrent protection requirements. SolarEdge power optimizers are constructed with 10 gauge PV wire output cables.

## SolarEdge Inverters

The DC input terminal blocks in the SE10000A-US, SE11400A-US, and the SE20kUS inverters support up to a #6 AWG conductor. A #6 AWG conductor is more than adequate to handle the combined current of 3 strings and allow for voltage drop in longer DC output circuits.

## Example

The following diagram illustrates the connection of 3 strings to the SE11400A-US inverter using a fused string combiner.




**SolarEdge Technologies | www.solaredge.com**

| | |
|---|---|
| **USA** | 3347 Gateway Boulevard, Fremont, CA, 94538 |
| **Germany** | Werner-Eckert-Straße 6, Munich 81829 |
| **Italy** | VISMUNDA SRL, Corso Del Popolo 50/A, Treviso |
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## Recommended 3 string combiner specifications for SE10000A-US and SE11400A-US inverters

1. Max voltage: 600V
2. Number of inputs: 6 - 3 x Plus and 3 x Minus
3. Fuses: on the positive and negative (6 fuses); 20A fuses
4. Input wire range: 14-6AWG
5. Output wire range: 14-6AWG
6. Equipment grounding wire range: 12-10AWG
7. Enclosure: NEMA 3R

## Recommended 3 string combiner specifications for SE20kUS inverters

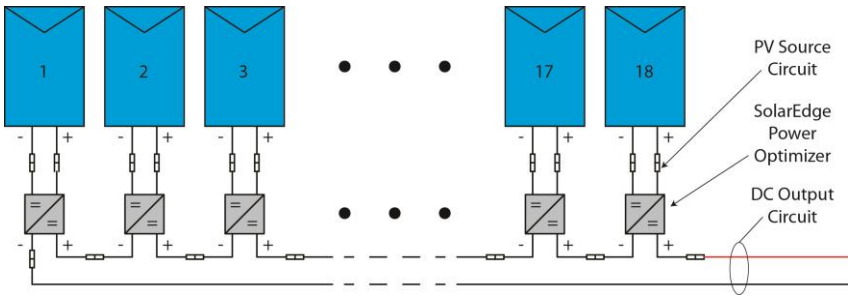
1. Max voltage: 1000V
2. Number of inputs: 6 - 3 x Plus and 3 x Minus
3. Fuses: on the positive and negative (6 fuses); 20A fuses
4. Input wire range: 12-6AWG
5. Output wire range: 12-6AWG
6. Equipment grounding wire range: 12-8AWG
7. Enclosure: NEMA 3R

6 July 2014

# String Fusing Requirements in SolarEdge Systems, Technical Note

## Introduction

String design and installation is significantly different in a SolarEdge system when compared to a traditional string inverter. PV modules do not get connected in series directly. Every PV module in the array is first connected to the input of a SolarEdge power optimizer, and the power optimizer output cables are connected to each other in series.




Consequently, the behavior of a SolarEdge system under fault conditions differs from that of a traditional string-inverter system.

This document compares the overcurrent protection mechanisms of both systems and analyzes the systems' responses to various fault scenarios. From this analysis it follows that string fuses are not required in SolarEdge systems.

## NEC Requirements

For string inverter systems, NEC article 690.9 outlines the overcurrent protection requirements for photovoltaic source circuits. The intent is to provide overcurrent protection for circuits connected to more than one electrical source. All sources of current need to be considered: multiple series strings of PV modules connected in parallel to the inverter as well as the string inverter itself.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## String Inverter Systems

String Inverters

Grounded installations with transformer-based inverters contain Ground Fault Detector Interrupt (GFDI) which detects ground current ≥1A. In these systems, fault current through the ground is limited to the GFDI limit (1A for inverters up to 25kVA).

Transformer-less inverters have a built-in Isolation Monitor Interrupter (IMI) circuit, which disconnects the inverter and ceases power export as soon as leakage current to ground is detected. However, some inverters may have a backfeed current >0A.

Strings

To prevent backfeed current from strings from flowing through other strings, diodes are needed. This is a costly solution that is rarely implemented. Typically, fuses are installed, but they don't prevent backfeed current, rather they eventually limit it in overcurrent fault situations. The only time a series fuse is exposed to overcurrent in these systems is when there is a low voltage (blind spot) fault on a grounded string conductor, and then a subsequent high voltage fault that short circuits the PV array. In that scenario, a current up to the short circuit current of the array flows through the string fuse which will clear with sufficient current.

PV Modules

PV modules have a fuse rating, so that if backfeed current greater than the fuse rating occurs, the fuse will blow and the backfeed current will be stopped.

## SolarEdge Systems

SolarEdge Transformer-less Inverters

The UL1741 safety standard requires that utility interactive inverters be evaluated under abnormal operating conditions. One of the abnormal tests determines the amount of current the inverter contributes to a faulted circuit connected to the inverter input terminals. SolarEdge inverters have been verified to provide zero backfeed current to the input source circuits, and have a built-in Isolation Monitor Interrupter (IMI) circuit, which disconnects the inverter and ceases power export as soon as leakage current to ground is detected.

The IMI circuit, which is evaluated as part of the inverter's UL1741 compliance, disconnects fault current flow above 150mA within less than 40ms (and disconnects lower fault currents within 300ms). Since the SolarEdge systems are ungrounded, once the inverter is disconnected there is no current flow to ground faults.

Strings with SolarEdge Power Optimizers

SolarEdge power optimizers provide internal current limitation as described in NEC article 690.8(B)(2). The power optimizers limit current at the PV module source circuit input to 10 amps and limit current at the optimizer DC output circuit to 15 amps. The SolarEdge power optimizers have been certified to provide zero backfeed current to the PV source circuit, and zero backfeed current to the rest of the string – i.e. the string current could flow in only one direction.

PV Modules

The power optimizer backfeed limitation of 0A prevents any backfeed current from reaching the modules, regardless of module fuse rating.

## Fault Scenarios – Three-String System

There are two fault scenarios to consider:

- Scenario 1 – A fault to ground in the middle of a string (fault #1 in the diagrams below)
- Scenario 2 – A fault in the wires at the end of a string (fault #2 in the diagrams below)

**Scenario 1**

String Inverter System

Backfeed current from the other strings flows to the fault. Since there are 3 strings connected to the inverter in parallel, the fault current from the other strings is 2 x Isc, and is not interrupted. If 2 x Isc is greater than the module fuse rating, NEC requires fusing on each of the string in order to prevent the risk of fire due to overcurrent.

SolarEdge System

The power optimizers in the faulted string prevent the backfeed current from the other strings from reaching the fault (see current direction in red in diagram below), and the current is limited to the 15A of the single faulted string. Since the optimizers are rated for this current, there is no fire hazard. Furthermore, the inverter IMI will detect the ground current and shut down within 40 or 300msec (depending on the current value). Since the SolarEdge system is ungrounded, as soon as the inverter is disconnected there is no connection to ground and therefore the current flow immediately stops.

**Scenario 2**

String Inverter System

Current from all strings flows to the fault. The fault current is 3 x Isc, and is not interrupted. If 3 x Isc is greater than the NEC permitted PV wire ampacity, NEC requires fusing on each of the string in order to prevent the risk of fire due to overcurrent.

SolarEdge System

Current from all strings flows to the fault. The fault current is 3 x 15A. The inverter detects the ground current with its built-in IMI circuit and disconnects the inverter in less than 40ms (well below typical[1] fuse clearing times of 5s and longer). Since the SolarEdge system is ungrounded, as soon as the inverter is disconnected there is no connection to ground and therefore the current flow immediately stops.

Since a total of 45A (3 x 15A) of current can flow on the final stage of the home-run cable continuously (Figure 2) the home-run cable ampacity in that section needs to be sufficient for this current. It is possible to step up the conductor size after adding each power optimizer string since each section of the circuit need only be sized for the continuous current. The fault current duration is short enough to ignore any size increases due to the 45A fault current.

[1] http://www.cooperindustries.com/content/dam/public/bussmann/Electrical/Resources/product-datasheets-a/Bus_Ele_DS_4203_PVS-R.pdf

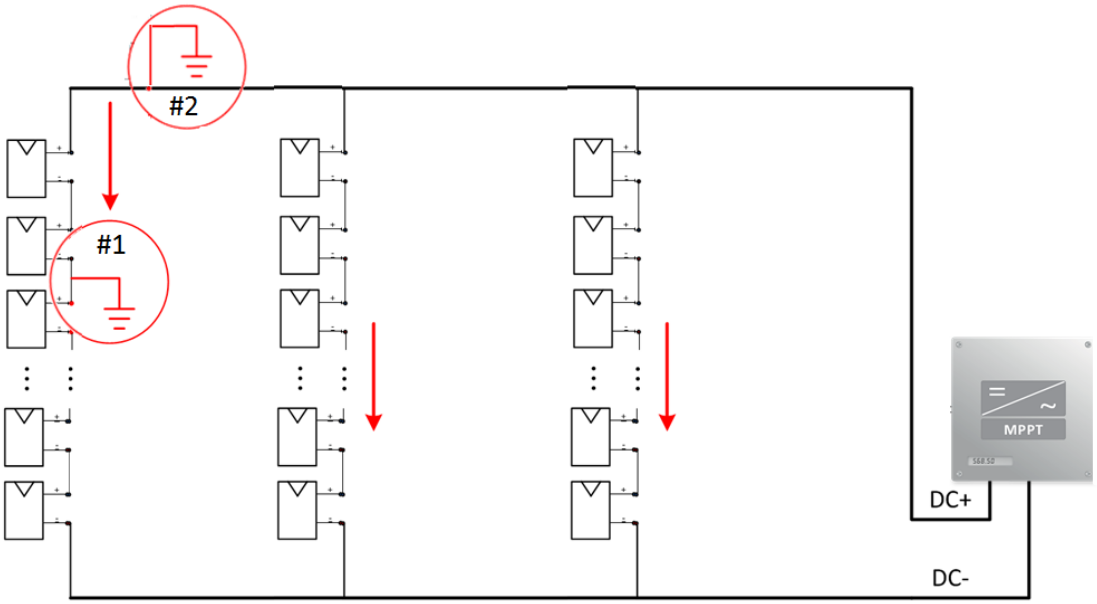


**Figure 1 – Fault scenarios in a string inverter system**

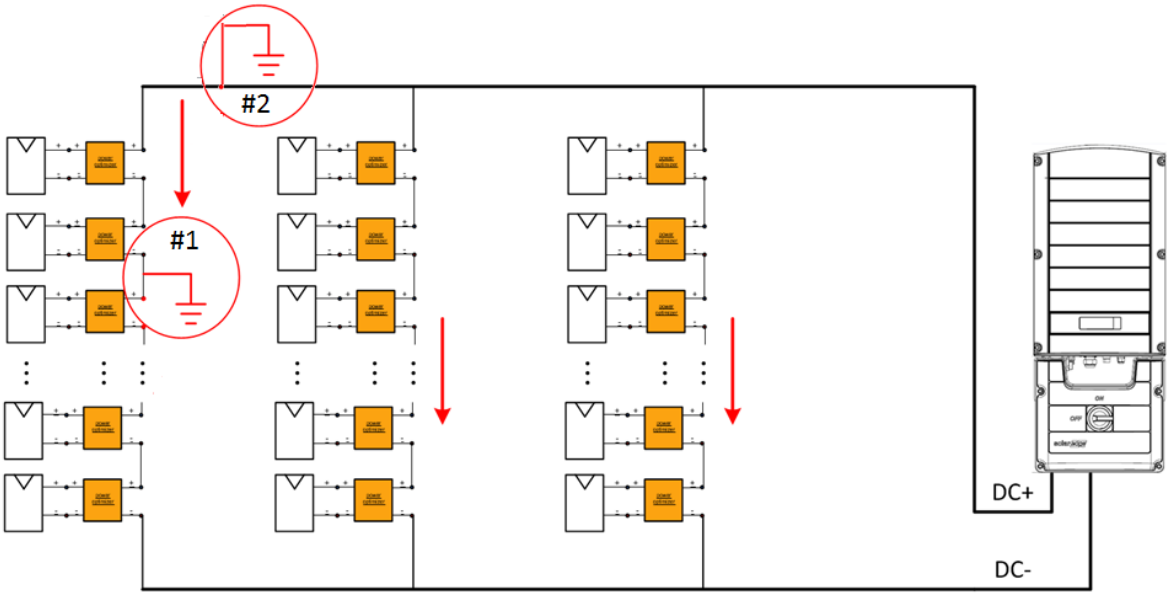


**Figure 2 – Fault scenarios in a SolarEdge system**