

Faith in Solar Webinar

Iowa Interfaith Power & Light



IOWA INTERFAITH
POWER & LIGHT

ISETA

The logo features a yellow sun icon with a black outline, positioned above the word "ISETA" in a large, bold, blue sans-serif font. A blue wavy line arches over the top of the letters.

PRESENTERS

Tim Dwight, Integrated Power / ISETA

Warren McKenna, Farmers Electric Cooperative

Logan Welch, Van Meter, Inc.



AGENDA

- 1. Welcome / Introductions**
- 2. Solar 101**
- 3. Application process**
- 4. Financing**
- 5. Q & A**
- 6. RE-AMP FaithSolar Action Team**

SOLAR EQUIPMENT

Modules

Inverters

Racking

Monitoring

AC Disconnect Switch

Permit

Plan Sets

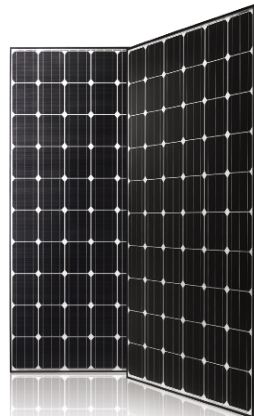
MODULES

Mono
Poly



MonoX™ NeoN

LG300N1C / LG295N1C / LG290N1C / LG285N1C / LG280N1C



LG Electronics, Inc. (Korea Exchange: 06657KKS) is one of the globally leading companies and technology innovator for electronics, information and communication products. The LG Electronics currently employs more than 91,000 people worldwide in 117 companies. In fiscal year 2011, 48.97 billion USD of revenue was achieved.

LG is one of the world's largest manufacturers of mobile phones, flat screen TVs, air conditioners, washing machines and refrigerators. As a future-oriented company, LG enables others to use technology consisting of renewable energies. LG's high quality solar products are being manufactured in LG's leading production facility in South Korea.



LG's High Efficient Cell Technology
Driven by LG's own N-type technology, LG's high-efficiency modules will provide customers with high economic benefits.

Light and Robust
With a weight of just 16.8 kg, LG modules are proven to demonstrate outstanding durability against external pressure up to 5400 Pa.

Reliable Warranties
LG stands by its products with the strength of a global corporation and sterling warranty policies. LG offers a 10 year product limited warranty and a 25 year* limited linear output warranty.

Convenient Installation
LG modules are carefully designed to benefit installers by allowing quick and easy installations throughout the carrying, grounding, and connecting stages of modules.

100% EL Test Completed
All LG modules pass Electroluminescence inspection. This EL inspection detects cracks and other imperfections unseen by the naked eye.

Positive Power Tolerance
LG provides rigorous quality testing to solar modules to assure customers of the stated power outputs of all modules, with a positive nominal tolerance starting at 0%.



Specifications

Cell Type	Multi-Crystalline Silicon
Cell Size	156mm x 156mm (6.14 x 6.14 in)
No. of cells and connections	72 (6x12)
Dimension of module(mm)	1956 x 992 x 40mm (77.01 x 39.06 x 1.57 in)
Weight	22.0kg (48.5lbs)
Power Tolerance	+/- 3%

Electrical Characteristics

Model	IPC290P-US
Maximum power at STC(Pm)	280W
PTC	261.3W
Open-circuit voltage(Voc)	44.72V
Short-circuit current(Isc)	8.84A
Voltage at Pmax(Vmp)	37.18V
Current at Pmax(Imp)	7.38A

Limits

Fuse rating	15A
Maximum system voltage	1000VDC (IEC)
Operating temperature	-40°F to +185°F (-40°C to +85°C)

Temperature and Coefficients

NOCT	48°C +/- 2°C
Temp coefficient of Voc	-0.31% (+/- 5%)
Temp coefficient of Isc	0.06% (+/- 5%)
Temp coefficient of power	-0.42% (+/- 5%)

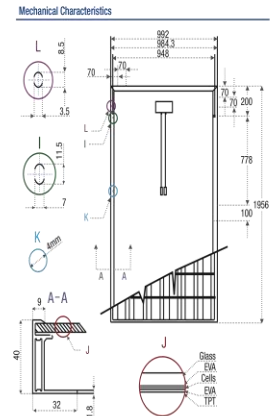
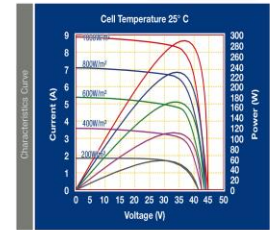
NOCT: Nominal Operation Cell Temperature

Output

Type of output terminal	IP65 Junction Box
Cable	12AWG PV Wire
Cable lengths	1000mm (39.37 in)
Connector	MCA or Tyco Solarlok

Warranty

Workmanship and Materials	5 Years
90% Power	10 Years
80% Power	25 Years



INVERTERS

Micro String Optimizer Central

SUNNY BOY 3000TL-US / 3800TL-US / 4000TL-US / 5000TL-US / 6000TL-US



- | | | | |
|---|---|--|--|
| <p>Certified</p> <ul style="list-style-type: none"> UL 1741 and 1699 compliant Integrated SPD meets the requirements of NEC 2011, 490.13 | <p>Innovative</p> <ul style="list-style-type: none"> Secure Power Supply provides dynamic power during grid outages | <p>Powerful</p> <ul style="list-style-type: none"> 97.2% maximum efficiency Wide input voltage range Simple management with Cybertop Global Peak MPPT tracking | <p>Flexible</p> <ul style="list-style-type: none"> Two MPPT trackers provide numerous design options Extended operating temperature range |
|---|---|--|--|

SUNNY BOY 3000TL-US / 3800TL-US / 4000TL-US / 5000TL-US / 6000TL-US

Setting new heights in residential inverter performance

The Sunny Boy 3000TL-US/3800TL-US/4000TL-US/5000TL-US/6000TL-US represents the next step in performance for UL certified inverters. Its streamlined design means high efficiency and reduced weight. Maximum power production is derived from wide input voltage and operating temperature ranges. Multiple MPPT trackers and Cybertop™ Global Peak mitigate the effect of shade and allow for installation at challenging sites. The unique Secure Power Supply feature provides dynamic power in the event of a grid outage. High performance, flexible design and innovative features make the Sunny Boy TL-US series the first choice among solar professionals.



SolarEdge Single Phase Inverters For North America

SE3000A-US / SE3800A-US / SE5000A-US / SE6000A-US / SE7800A-US / SE10000A-US / SE14000A-US



The best choice for SolarEdge enabled systems

- Integrated anti-islanding (AIC) for NEC 2011, 490.13 compliance
- Superior efficiency (98%)
- Small, lightweight and easy to install on pre-wired brackets
- Full AC module-level monitoring
- External connection through Ethernet or Wireless
- Outdoor and indoor installation
- Real voltage monitoring, SCAC compliance only
- Permanently Safety Switch for faster installation
- Optional - internal surge protector (ANSI-C12.1)

USA: (800)841-1111 / FRANCE: 0969 348844 / CHINA: 4006 821444 / THE NETHERLANDS: 0840 000 000

www.solaredge.us

Enphase MicroInverters Enphase S280



Designed for high-powered, 60-cell modules, the advanced grid-ready Enphase S280 Microinverter™ is built on the fifth generation platform and achieves the highest efficiency for module-level power electronics along with cost per watt reduction. With its all-in-one approach, the S280 simplifies design and installation for 280 VA installations, and delivers optimal energy harvest. The S280 is compatible with storage systems, including battery management systems.

The Enphase S280 integrates seamlessly with the Enphase EnvoyS™ communications gateway, and Enphase Enlighten™ monitoring and analysis software.

- | | | |
|--|---|--|
| <p>PRODUCTIVE</p> <ul style="list-style-type: none"> Optimized for high-powered, 60-cell modules Maximizes energy production Minimizes impact of shading, dust, and debris | <p>SIMPLE AND RELIABLE</p> <ul style="list-style-type: none"> No GND needed for microinverter No DC design or string calculation required More than 1 million hours of testing Industry-leading warranty, up to 25 years | <p>ADVANCED GRID READY</p> <ul style="list-style-type: none"> Complies with feed power factor, voltage and frequency ride-through requirements Remote updating to respond to changing grid requirements Certifiable for variable grid profiles Like Hawaiian Electric Company (HECO) Rule 14K, California Rule 21 |
|--|---|--|



COMMERCIAL INVERTERS

SGI 225
SGI 250
SGI 266
SGI 300
SGI 500
SGI 500PE

FEATURES

- 97.5% CEC efficiency
- Highest CEC efficiency in the industry
- Built in redundancy
- Subcabinet options
- 480V/500V or 600V VAC
- Modular construction
- User interactive LCD

OPTIONS

- Optim. guarantee
- Stainless steel enclosure
- Web-based monitoring
- Built in remote control relay

OPTIONS FOR UTILITIES

- Real power curtailment
- Reactive power control
- Voltage ride through
- Frequency ride through
- Combined ramp rates



COMMERCIAL INVERTERS

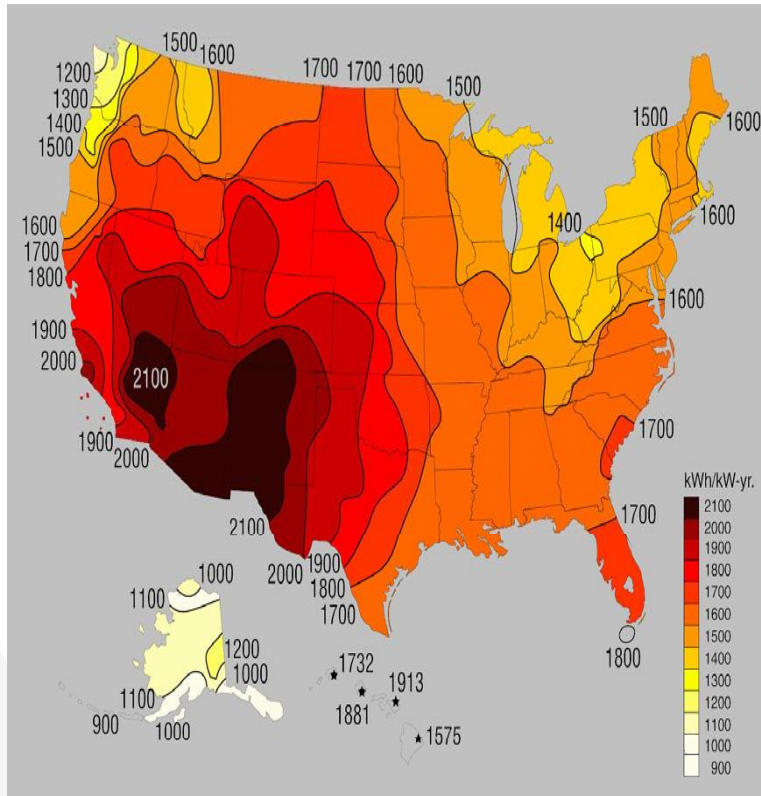
Soletrیا Renewables' SMARTGRID 225-500PE series of inverters boasts an industry leading 97.5% CEC weighted efficiency which translates into significantly greater energy production and cost savings over the lifetime of the system. The SGI line has been deployed in a large number of commercial and utility-scale PV systems across North America ranging from 200kW to multi-MW. Our customers find these to be the most cost-effective, reliable, and efficient inverters in the market. This product family offers utility options such as voltage and frequency ride through, controlled ramp rates, reactive power control, and real power curtailment. Such critical utility options, combined with unsurpassed efficiency and the lowest nighttime fare losses in the industry, earmark the SGI Series as the premier inverter for next generation large commercial systems.



Built for the real world

US Solar Market

Potential

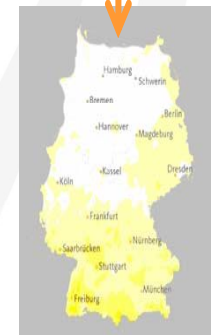


The world's largest solar market (Germany) installed ~1.3 Gigawatts of solar in 2008— approx \$9,100,000,000 USD

•Germany = 47% Global Solar Market

•USA = 8% Global Solar Market

Germany's Solar Resources



Interconnection Agreements: *Net-metering vs Self-metering*

Net-metering – an agreement between the QF and the utility that agrees upon the utility paying for any excess energy, out to the grid, is purchased by the utility at “retail” cost.

Self-metering – an agreement between the QF and the utility that agrees upon any excess energy, out to the grid, is be purchased by the utility at “wholesale” or “avoided” cost.

CHOOSING A SOLAR INSTALLER

THE PROCESS OF A SOLAR PROJECT

Step 1: Call (3) solar installers for a quote. (1 week)

Step 2: Review with installers their quotes, equipment. (week 2)

Step 3: Review and compare notes of all the quotes received. Call References. (week 2)

Step 4: Chose the installer with best equipment and competitive quote. (week 3)

Step 5: Cut contract and down payment (week 3)

CHOOSING A SOLAR INSTALLER, CONT.

Step 6: Utility application submittal along with site plan, single line diagram, utility letter and copy of insurance. (solar installer should assist) (week 3-4)

Step 7: Utility approval letter. Pull electrical and possibly a building permit. (week 4-5)

Step 8: 2nd invoice for all equipment to be delivered. (week 6-7)

Step 9: Equipment delivered. Set installation date. (week 7-8)

CHOOSING A SOLAR INSTALLER, CONT.

Step 10: Conclude solar installation. AHJ sign off on permit. (week 10-14)

Step 11: Sign and send in Certificate of Completion document. (week 13/14)

Step 12: Utility signs off on Certificate of Completion, Witness test document then mails a Permission to Operate letter. (week 14-16)

Step 13: Apply for State of Iowa Tax credit online (certificate number) & Federal tax credit. (week 15)

Step 14: Save money, save energy, and save the planet.

FINANCING SOLAR



FINANCING FOR RESIDENTIAL, COMMERCIAL & AG, MUNICIPAL, SCHOOLS, UTILITY AND NON- PROFITS

A. Loans

B. Leasing

C. PPA

D. Other options

RESIDENTIAL

Unsecured Personal Loans – Typically \$ 1,000 to \$ 65,000

As low as 4% to 16%

36 months to 12 years (longer term equals better cash flow)

Example:

Electric bill savings = (kWh/year) × (Residential Rate) = \$/year

Offset of 30% or 400 kWhrs for a typical 1000kWhr/mnth

12000 x .125 energy rate = \$ 1,500 / year x .30 = \$ 500 / 12 = \$ 42.00

12mods @ 280 watts = 3.36 kW (estimated size for this offset)

\$ 10,000 (@ \$3/watt) x .48 (state & fed tax credit) - \$ 4,800 = \$ 5,200

-\$2,000 down = \$ 3,200 / 6 yr loan / 12 months = \$ 44 principal only

Wrap it into your mortgage on refinance or at time of home purchase

COMMERCIAL & FARM

Federal and State tax credits plus depreciation

IA @ 15% with \$ 20,000 cap up to \$ 5,000,000/yr

Federal tax credit = 30% but declines starting 2020/year

Iowa Area Development Group Energy Bank Revolving Loan Fund

1% rate -- \$ 50,000 to \$ 300,000

Iowa Energy Center loan funding is currently suspended

Energy Lease

Zero money down

5 to 7 year term

Options to keep tax credits -- no tax liability required

Buyout at end of lease – \$1 to 15%

5% rate typical

Modified Accelerated Cost-Recovery System (MACRS) (5 year depreciation schedule)

50% first year bonus depreciation prior 2018 then drops to 40% (adds in 1st year)

NOT FOR PROFITS (MUNICIPAL, SCHOOLS, UTILITY NON-PROFITS)

Renewable Electricity Production Tax Credit (PTC) – 1.5 cents 750 kW minimum 2.5 MW/owner

63 MW non-wind cap AC

49 MW applications

Bank franchise tax offset – line item – sample contract

3rd Party Ownership

PPA – larger projects because of legal expense

Typical 20 year term with buyout periods

Rate escalators

Lease – Lease provider takes tax credits (taxable corp.)

Fixed rate

Fixed buyout amount

Term 7 to 10 year

Load tagging to maintain revenue neutral or rate positive projects

Rate segregation with solar on non-demand metering

Load growth and or energy efficiency coupling

OVERLOOKED INCENTIVES

Iowa sales tax exemption

Iowa property tax exemption

**Iowa Sales Tax Exemption Certificate (Energy used in processing or agriculture)
– 3 yr refund**

REAP Grants

25% of cost of solar array

Primarily agricultural operations and small businesses in rural areas.

City of Ames Municipal Utility rebate – \$ 500 x kW with a max of \$ 15,000

City of Hawkeye Solar Rebate -- \$ 500 to \$ 1000 depending on system size

**Fairfield Economic Development Association Financing -- \$ 3,000 to \$ 300,000 at
4% for 3 to 10 years**

Future – SREC aggregation and reseller program

Q & A

Faith & Solar



**500
People in
Wisconsin**

How solar energy can bring people of faith together to care for Earth -our common home- and save money to reinvest in their missions.



**Over 25
Presentations**

<https://WisconsinGreenMuslims.org/FaithSolar/>

Contact: info@WisconsinGreenMuslims.org / [@WlgreenMuslims](https://www.instagram.com/WlgreenMuslims)



Open Space Session at RE-AMP Annual Meeting, July 12, 2017



THANK YOU!

References

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<http://www.cityofames.org/government/departments-divisions-a-h/electric/smart-energy/solar-energy>