



**BROWARD**  
COUNTY  
FLORIDA

# GO SOLAR

Broward Rooftop Solar Challenge

Making Solar Energy Easy





# Net Metering and Interconnection

- Mr. Sean M. Sammon
- April 23<sup>rd</sup>, 2012
- *Standardized Permitting Committee Meeting*




# Interconnection

- Interconnection refers to the technical and practical aspects of connecting the solar generator to the grid
- System parts directly related to interconnection:
  - The DC to AC power inverter
  - Disconnect switches
  - Distribution panel
  - Meter
- A grid-tied system that includes battery backup will have additional interconnection components



# FPL's Interconnection Application

 <b>FPL Net Metering Program</b> <b>Application for Interconnection</b>	
<b>System Size:</b>	
Tier 1: 10 kW or less "NO CHARGE"	
Tier 2: Greater than 10 kW and less than 100 kW. A \$400.00 application fee will be invoiced upon receipt of this agreement.	
Tier 3: Greater than 100 kW up to 2 MW. Please include \$1,000.00 application fee. (make check payable to FPL) Include Electrical One-Line Diagram	
<b>Renewable system source type:</b>	
(please check all that apply)	
<input type="checkbox"/> Solar	<input type="checkbox"/> Ocean energy
<input type="checkbox"/> Wind	<input type="checkbox"/> Hydrogen power
<input type="checkbox"/> Bio-mass	<input type="checkbox"/> Waste heat
<input type="checkbox"/> Hydroelectric	<input type="checkbox"/> Geothermal
<b>Customer Information:</b>	
Customer Name: .....	
Street Address: .....	FPL Acct # .....
City: .....	State: ..... Zip: .....
Contact Name: .....	
Phone: .....	Fax .....
Email address: .....	SS # or Tax ID # .....
<b>System Information:</b>	
Manual disconnect switch must be in the open position prior to submittal:	
Inverter Manufacturer: .....	Model #: .....
Total System DC Capacity _____ kW	AC Gross Power Rating _____ kW (DC Generating Capacity x 0.85)
Renewable generation manufacturer: .....	Model #: .....
If solar: _____ kW / Unit:	Installed Date: .....
# of panels: .....	Type of Panel: .....
Installed by: .....	Installed cost: .....
<b>FPL use only:</b>	
Annual kWh: .....	Max kWd: .....
Feeder Number: .....	TLN: .....
Comments: .....	



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# Florida Solar Energy Center (FSEC) Interconnection Application

## INTERCONNECTING A SMALL PHOTOVOLTAIC SYSTEM TO THE ELECTRIC UTILITY GRID APPLICATION AND COMPLIANCE FORM

<b>A. Applicant Information</b>
Name: _____
Mailing Address: _____
City: _____, FL Zip Code: _____
Street Address (if different from above): _____
Daytime Phone: _____ Fax: _____ Email: _____
Electric Utility Name: _____ Account No.: _____
<b>B. Photovoltaic System Information</b>
System Name/Model: _____ PV System Power Rating _____ ac watts
List Manufacturer/Model for: _____
Modules: _____ Inverter: _____ Batteries (if applicable): _____
Array Location: _____ Inverter Location: _____
AC Disconnect Location: _____ Permission to Monitor? - Yes - No
<b>C. Installation Contractor Information</b>
Installation Contractor: _____, FL License No.: _____
Address: _____
City: _____, FL Zip Code: _____
Daytime Phone: _____ Fax: _____ Email: _____
Proposed Installation Date: _____
<b>D. Hardware and Installation Compliance</b>
1. The system hardware is in compliance with Underwriters Laboratories (UL) 1741, Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Systems and UL 1703, Standard for Safety: Flat-Plate Photovoltaic Modules and Panels, and IEEE 1262-1995, IEEE Recommended Practice for Qualification of Photovoltaic (PV) Modules.
2. The system has been installed in compliance with IEEE Standard 929, Recommended Practice for Utility Interface of Photovoltaic Systems and the 1999 National Electrical Code® (NEC).
Signed (Contractor): _____ Date: _____
Name (Print): _____ Company: _____
<b>E. Owner Acknowledgment</b>
The system has been installed to my satisfaction and I have been given system warranty information, and an operation manual. Also, I have been informed of the option to choose net metering, and have been instructed in the operation of the system.
Signed (Owner): _____ Date: _____
<b>F. Electrical Code Inspection and Utility Approval</b>



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# Net Metering

- Net metering is a method of billing and crediting the power consumed and produced, to the consumer
- Residential
- Small Business

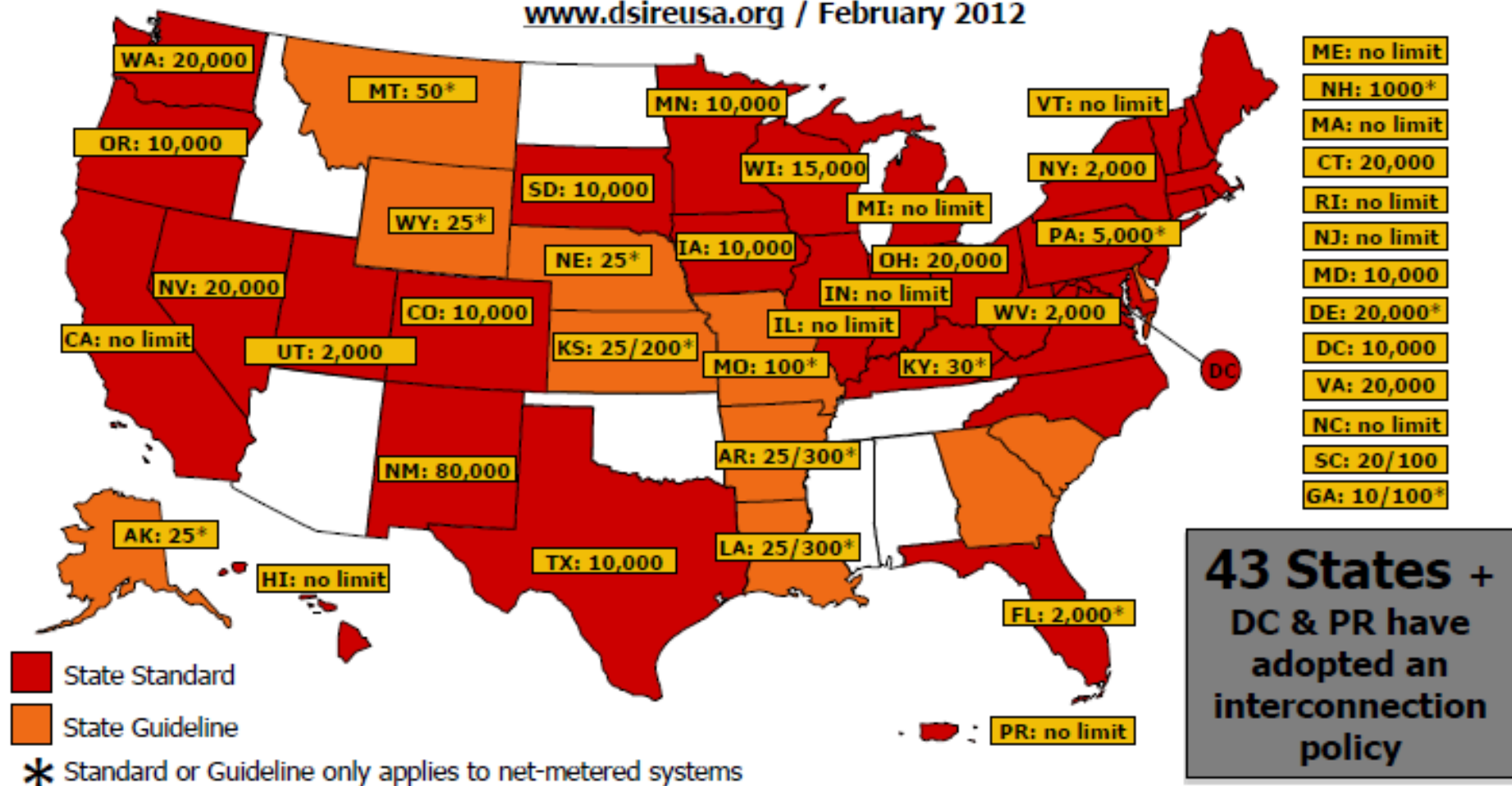


# State of Florida Rule - Interconnection

- “Net metering” means a metering and billing methodology whereby customer-owned renewable generation is allowed to offset the customer's electricity consumption on-site
- To qualify for expedited interconnection under this rule, customer-owned renewable generation must have a gross power rating that:
  1. Does not exceed 90% of the customer’s utility distribution service rating
  2. Falls within one of the following ranges:
    - Tier 1 - 10 kW or less;
    - Tier 2 – greater than 10 kW and less than or equal to 100 kW
    - Tier 3 – greater than 100 kW and less than or equal to 2 MW

## Interconnection Policies

[www.dsireusa.org](http://www.dsireusa.org) / February 2012



*Notes: Numbers indicate system capacity limit in kW. Some state limits vary by customer type (e.g., residential/non-residential). "No limit" means that there is no stated maximum size for individual systems. Other limits may apply. Generally, state interconnection standards apply only to investor-owned utilities.*





# FPL Net Metering

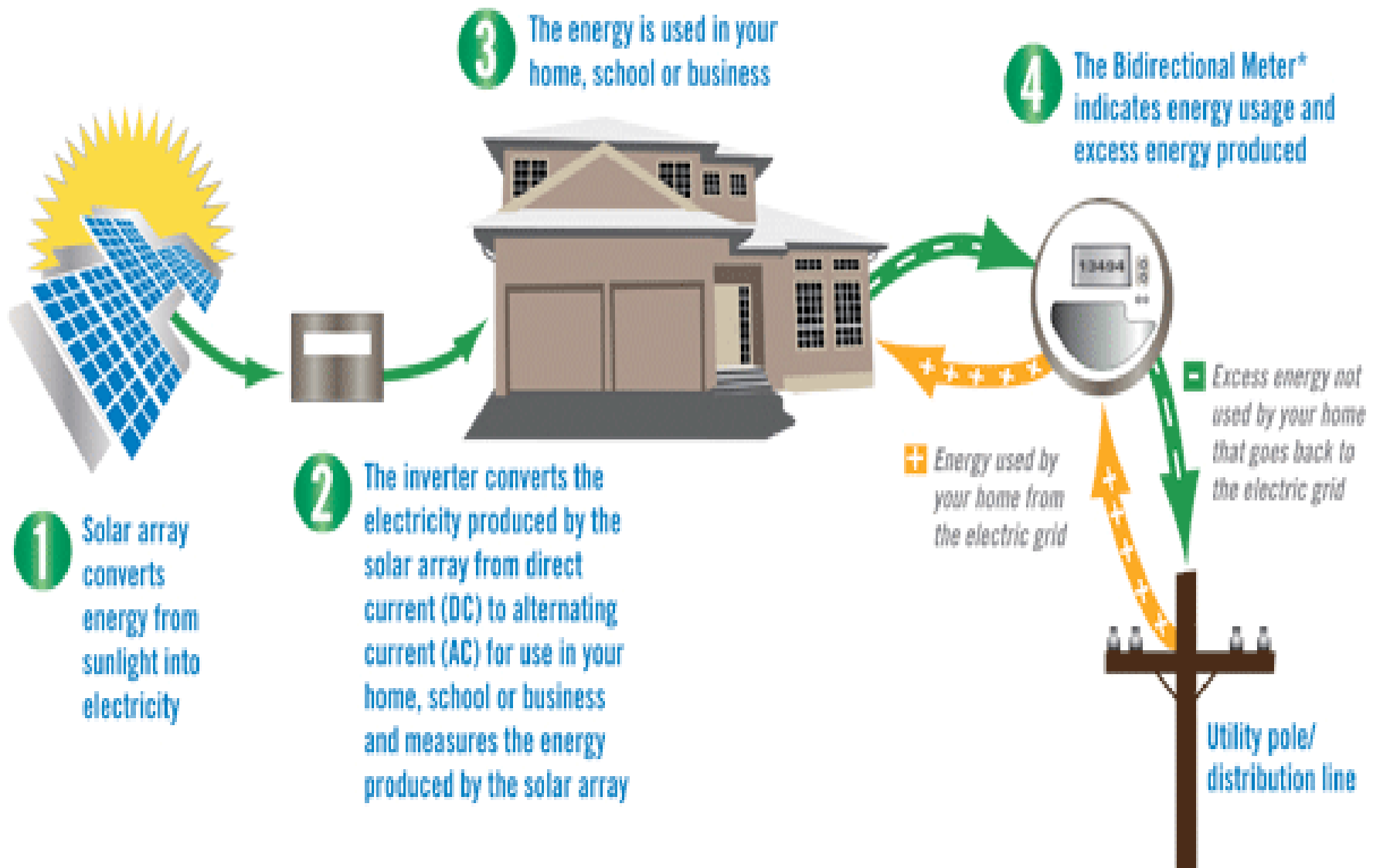
- The goal of Net Metering is to offset all or part of the customer's energy use at the customer's metered service account
- To offset your energy use at the retail rate (the highest rate) the output from your renewable generator must be used behind the meter where it is connected
- Any energy not consumed behind the meter will be sent to the grid and will be accumulated in a "bank" to be drawn on every month as needed to offset future energy used from FPL



FPL

# Understanding NET METERING

## Solar Photovoltaic Array Example





# FPL PV Application Checklist



FPL Solar Rebate Programs

## Photovoltaic (PV) Application Checklist

Thank you for your interest in FPL's Solar Rebate Programs! During the next rebate cycle, FPL will take online applications for rebates on a first-come, first-served basis. Demand for these rebates is expected to be high, so the better you are prepared, the more likely it is you will secure one. If you have not already done so, please follow the recommended step-by-step process for your rebate program, found on [www.FPL.com/solarrebates](http://www.FPL.com/solarrebates) and on the next page of this document. **Please be prepared to enter every item on this checklist into the online application.**

### Customer Contact Information

First Name:  Last Name:

Primary Phone Number: -- Extension:  Secondary Phone Number: -- Extension:

Email Address:

### Contractor Contact Information

Contractor's Business Name:  Contractor's License Number:

Contractor's First Name:  Contractor's Last Name:

Contractor's Primary Phone Number: -- Extension:  Contractor's Secondary Phone Number: -- Extension:

Contractor's Email Address:

### System Information

Panel Size 1	Panel Size 2	Panel Size 3	Panel Size 4
Number of Panels: <input type="text"/>	Number of Panels: <input type="text"/>	Number of Panels: <input type="text"/>	Number of Panels: <input type="text"/>
Watts Per Panel: <input type="text"/>	Watts Per Panel: <input type="text"/>	Watts Per Panel: <input type="text"/>	Watts Per Panel: <input type="text"/>
Panel Model Number: <input type="text"/>	Panel Model Number: <input type="text"/>	Panel Model Number: <input type="text"/>	Panel Model Number: <input type="text"/>
Panel Manufacturer: <input type="text"/>	Panel Manufacturer: <input type="text"/>	Panel Manufacturer: <input type="text"/>	Panel Manufacturer: <input type="text"/>
Inverter Model 1 Quantity: <input type="text"/> Inverter Model: <input type="text"/> Inverter Manufacturer: <input type="text"/>	Inverter Model 2 Quantity: <input type="text"/> Inverter Model: <input type="text"/> Inverter Manufacturer: <input type="text"/>	Inverter Model 3 Quantity: <input type="text"/> Inverter Model: <input type="text"/> Inverter Manufacturer: <input type="text"/>	Inverter Model 4 Quantity: <input type="text"/> Inverter Model: <input type="text"/> Inverter Manufacturer: <input type="text"/>
Total Installed System Cost: <input type="text"/>		Projected Annual kWh: <input type="text"/>	



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# FPL Rebate Step by Step



FPL Solar Rebate Programs

## Step-by-Step Process for Photovoltaic (PV) Rebate Applications

### 1 Get informed

- Review the program standards and requirements on [www.FPL.com/solarrebates](http://www.FPL.com/solarrebates)
- Do your own additional research as needed.

### 2 Evaluate your options\*

- Identify one or more licensed contractors of your choice and schedule meetings to discuss your options.
- Get estimates, select a final contractor and secure a final quote.
- Work with your contractor to complete all fields on the application checklist. *Be prepared to enter every item on the checklist into the online application.*

### 3 Get ready

- You will need to log-in to your account on [www.FPL.com](http://www.FPL.com) in order to apply for this program, so you should register for online access to your account if you do not already have it.
- Be ready to submit your application at [www.FPL.com/solarrebates](http://www.FPL.com/solarrebates) during the next rebate cycle.

### 4 Get set and go

- FPL will review your application and notify you of acceptance or deficiencies within three business days at the email address that you provided.
- If accepted, you will receive an email from FPL with your reservation number and the quantity of funds reserved for your application. *(If the final size of your system is smaller than indicated, your rebate will be adjusted accordingly.)*
- From the date your reservation is sent, residential customers will have 90 days and business customers will have 120 days to have your system installed and inspected and submit final documentation to FPL to receive your rebate.
- All PV systems installed under this program must be interconnected with FPL and must comply with interconnection requirements for net metering. If your PV system is a Tier 2 (>10kW - 100kW) or Tier 3 (>100kW - 2MW), you must email a one-line diagram showing the manual visual load break disconnect switch to [netmetering@fpl.com](mailto:netmetering@fpl.com). FPL will review the appropriateness of this switch; notify you of approval or deficiencies; and if approved, send you an invoice for the net metering interconnection application fee. For more information on this requirement, please visit [www.FPL.com/netmetering](http://www.FPL.com/netmetering) and refer to the Tier 2 and 3 agreements.
- In the event that rebate funds are no longer available when you apply and you still move forward with installing a PV system (forgoing a future rebate), please be sure to follow net-metering obligations at [www.FPL.com/netmetering](http://www.FPL.com/netmetering)

### 5 Claim your rebate

- When the installation is completed and approved by your local authorities, submit the following documents to FPL by email at [SolarPVResRebate@fpl.com](mailto:SolarPVResRebate@fpl.com) (residential customers), or [SolarPVBusRebate@fpl.com](mailto:SolarPVBusRebate@fpl.com) (business customers) or by mail to: FPL - Solar Rebates - CSF/CB / P.O. Box 29311 / Miami, FL 33102. Keep copies for your records.
  - The FPL Rebate Certificate (can be downloaded at [www.FPL.com/solarrebates](http://www.FPL.com/solarrebates)) with the customer's signature;
  - A signed purchase agreement contract for the purpose of the photovoltaic system;
  - A document showing the anticipated annual electric production of the proposed system using the *PV Watts-1 calculation* (<http://redec.net.gov/solar/calculators/PVWATTS1/version1/>), including any appropriate de-rate for any shading;
  - Digital photos of the installation and panel nameplate(s);
  - A copy of the contractor's invoice;
  - A signed interconnection agreement and net-metering application with all net-metering documentation, including a paid interconnection application fee;
  - A copy of the final passed permit, indicating that the date of the permit application was after the rebate reservation date; and
  - If your PV system is Tier 2 or 3, proof of insurance.
- FPL reserves the right to request additional documentation and/or make a site visit to verify the installation prior to rebate payment. FPL will verify the installation of all Tier 2 and 3 systems.
- FPL will notify you via email when your documentation is approved and your final rebate amount is confirmed.
- FPL will mail the rebate check to the mailing address you submitted on your application. You will receive the check within six to eight weeks.

\* FPL does not endorse or recommend any individual installers for any of its programs, nor does FPL bear any responsibility for the quality or performance of any products or contractors chosen or hired by the customer. Customers should choose products and contractors carefully, given the many variables involved. The decision to select, hire and the management of the contractor that will install the eligible products is the customer's sole responsibility. FPL bears no responsibility for the quality or performance of any products or contractors chosen by the customer. There are many installers in Florida with varying levels of capability and experience. Please check to make sure the work performed by your contractor meets all applicable licensing and building code requirements.



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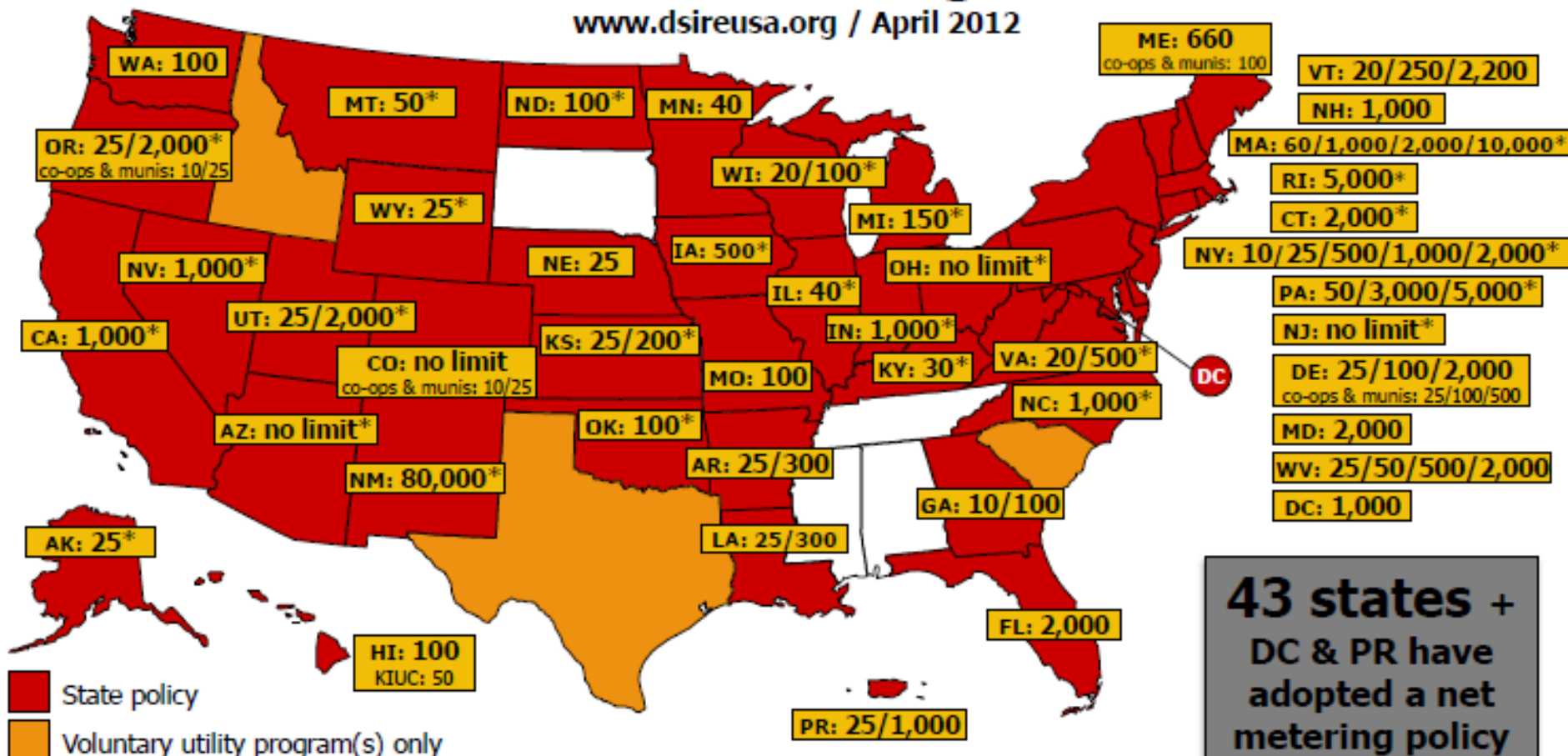


# State of Florida Rule – Net Metering

- Meter readings shall be taken monthly on the same cycle as required under the otherwise applicable rate schedule
- During any billing cycle, excess customer-owned renewable generation delivered to the investor-owned utility's electric grid shall be credited to the customer's energy consumption for the next month's billing cycle
- Crediting keeps the customer connected to the grid

## Net Metering

www.dsireusa.org / April 2012



**43 states + DC & PR have adopted a net metering policy**

Note: Numbers indicate individual system capacity limit in kW. Some limits vary by customer type, technology and/or application. Other limits might also apply. This map generally does not address statutory changes until administrative rules have been adopted to implement such changes.

# Cleveland Clinic Health Space Meter



**Health Space, Cleveland Clinic** - [View System Summary](#)

Revenue-Grade [Inverter-Direct](#)

[Day](#) [Week](#) **Month**

**AC Energy** [AC Power](#) [AC Voltage](#) [AC Current](#) [DC Voltage](#)

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Now: Thurs Apr 19, 2012 12:36 am EDT

Apr 1 2012

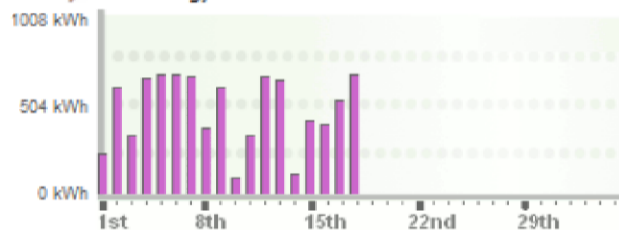
### AC Energy- This month [April, 2012]

Device	This month	Lifetime	Timestamp
sys#1 Revenue-Grade	8351.4 kWh	129888.2 kWh	[Apr 19 2012 12:35 am]



\*\* Note: Each colored block represents time-span of 1 day. \*\*

AC Energy - This month



- Source: [www.solrenview.com](http://www.solrenview.com), April 2012



**SOLRENVIEW**

**SOLECTRIA RENEWABLES**

**Health Space, Cleveland Clinic - [View System Summary](#)**

[Revenue-Grade](#) [Inverter-Direct](#)

[Day](#) [Week](#) [Month](#)

[AC Energy](#) [AC Power](#) [AC Voltage](#) [AC Current](#) [DC Voltage](#)

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Now: Thurs Apr 19, 2012 12:55 am EDT

Apr 16 2012

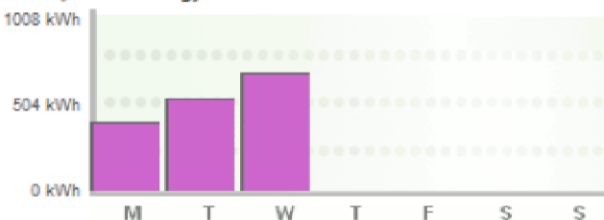
**AC Energy - This week [Mon Apr 16, 2012]**

Device	This week	Lifetime	Timestamp
sys#1 Revenue-Grade	1537.5 kWh	129888.2 kWh	[Apr 19 2012 12:55 am]



**Note: Each colored block represents time-span of 1 day.**

AC Energy - This week



- Source: [www.solrenview.com](http://www.solrenview.com), April 2012

**Health Space, Cleveland Clinic** - [View System Summary](#)

Revenue-Grade [Inverter-Direct](#)

Day [Week](#) [Month](#)

[AC Energy](#) [AC Power](#) [AC Voltage](#) [AC Current](#) [DC Voltage](#)

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Now: Thurs Apr 19, 2012 12:58 am EDT

Apr 18 2012

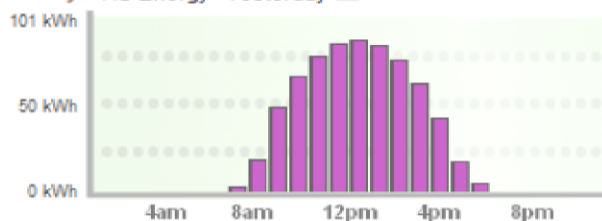
**AC Energy - Yesterday [Wed Apr 18, 2012 EDT]**

Device	Yesterday	Lifetime	Timestamp
sys#1 Revenue-Grade	649.4 kWh	129888.2 kWh	[7:45:55 pm]



\*\* Note: Each colored block represents time-span of 1 hour. \*\*

AC Energy - Yesterday



- Source: [www.solrenview.com](http://www.solrenview.com), April 2012

# Revenue



**REPORT FOR**  
HEALTH SPACE, CLEVELAND CLINIC  
540 E 105TH  
CLEVELAND, OH

**SYSTEM SIZE**  
101 kW

**PRODUCTION PERIOD**  
Mar 1 to Mar 31, 2012

**SITE ID**  
347

PRODUCTION PERIOD	NO. OF DAYS	NEXT SCHEDULED UPDATE
Mar 1 to Mar 31	30	May 01, 2012

**STATEMENT SUMMARY**

Updated Reading	Mar 31, 2012	121536.8 kWh
Previous Reading	Feb 29, 2012	- 111357.4 kWh
<b>AC Energy Produced</b>		30 days 10179.4 kWh
	Dollar Per kWh	X \$ 0.15
<b>Revenue</b>		<b>\$1526.91</b>

**PRODUCTION HISTORY**

Month	kWh	Month	kWh
Mar 2011	8808	Oct 2011	7006
Apr 2011	8729	Nov 2011	4916
May 2011	12913	Dec 2011	2907
Jun 2011	15438	Jan 2012	2900
Jul 2011	16611	Feb 2012	6013
Aug 2011	14672	Mar 2012	10179
Sep 2011	8502		

■ AC Energy- Past year



Month	kWh
Mar	8808
Apr	8729
May	12913
Jun	15438
Jul	16611
Aug	14672
Sep	8502
Oct	7006
Nov	4916
Dec	2907
Jan	2900
Feb	6013
Mar	10179

# Santiago de Chile Research

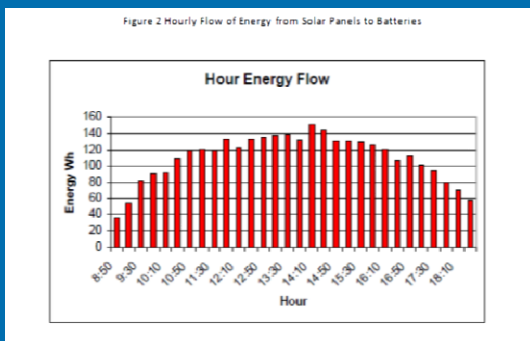
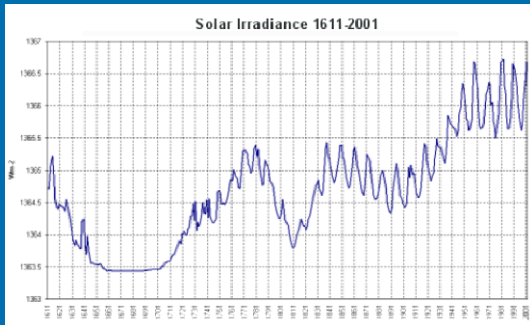


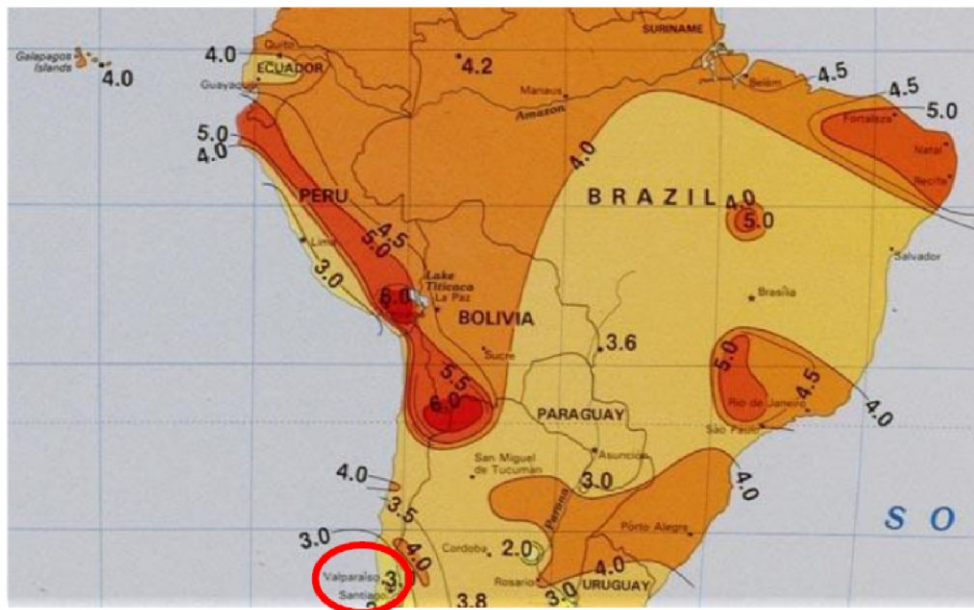
Table 1 Santiago de Chile Climate Average s, 2012

Totals and averages

Annual average high temperature:	63 °F
Annual average low temperature:	46 °F
Average temperature:	55 °F
Average annual precipitation:	75 in.
Days per year with precipitation:	141 d.
Average annual hours of sunshine:	2462 h

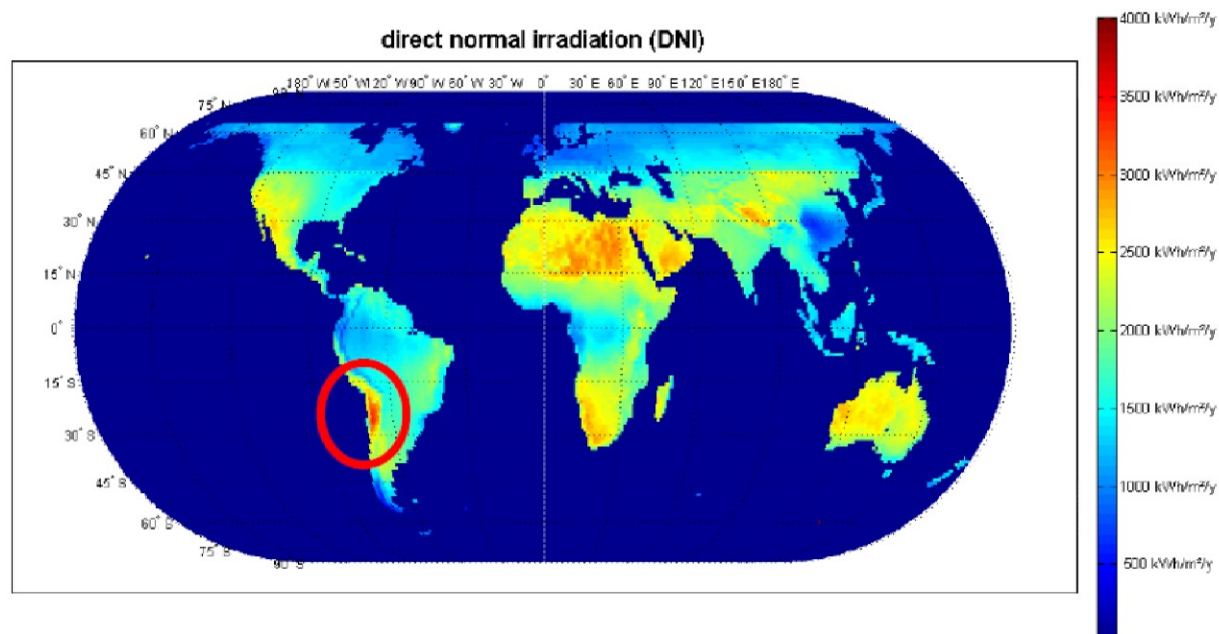
# Best Performance, Worst Time of Year

Figure 3 This map shows the amount of solar energy in hours, received each day on an optimally tilted surface during the worst month of the year for South America; circled in red is the city of Santiago



# Global Irradiation

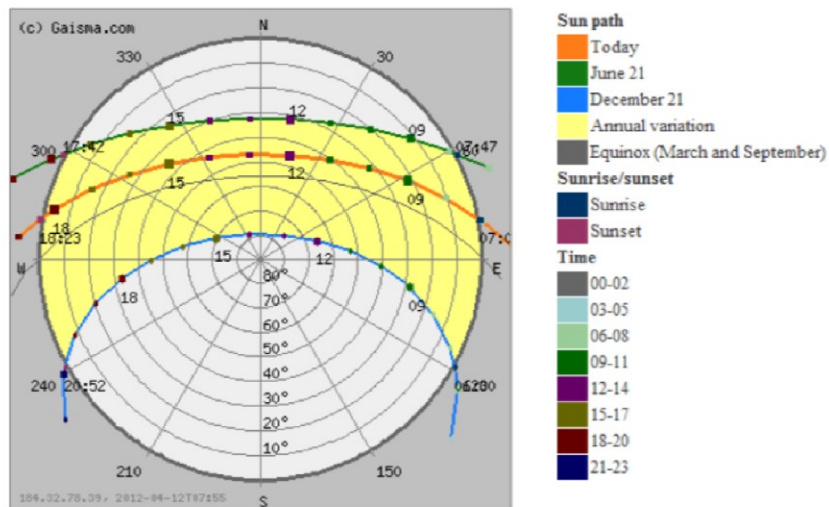
Figure 4 Global Intensity Rate Map for Solar Irradiation



# Tracking the Sun's Path

Figure 5 Annual solar tracking map for Santiago de Chile

Santiago, Chile - Sun path diagram



# Santiago Survey



- Rooftops of Businesses



## Santiago Survey



- Rooftops of residential units



Thank You

Questions?



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