

PG&E Webinar

11.05.09

*Solar for the Entrepreneur (for Product Developers)*

# Solar for the Entrepreneur

## *For Product Developers*

**Matt Heling**

**Program Manager**

**Solar & Customer Generation**

**Pacific Gas and Electric Co.**





# Goal

**Identify the various resources and requirements that the solar entrepreneur needs to be familiar with to advance a solar product**

- **Focus is on electric generation**
- **Presented from PG&E perspective**



# Agenda

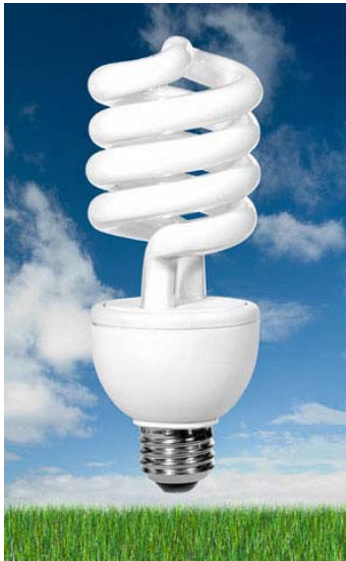
- Energy efficiency
- PG&E solar programs
- Product-related opportunities with PG&E
- Product certification requirements



# Energy Efficiency



## Energy Efficiency



- Energy efficiency is typically the most **cost-effective** way to reduce a customer's energy bill
- Energy efficiency also **reduces the size of the solar system** that is needed
  - Can save **\$1,000's** of dollars on the cost of the system
- An **energy efficiency audit** is required to be eligible for some customer-side incentive programs



# Large Solar PG&E Home: PV System Cost and Payback

Size and Cost of Solar Before EE (6.1 kW)	Cost of Implementing EE	Size and Cost of Solar After EE (3.6 kW)	Total Combined Cost
\$ 34,898*	\$ 6,962	\$ 19,047	\$ 26,009*
~ 15 years	~4 years	~ 22 years	~ 10 years

**Large Solar PG&E Home Total Upfront Savings: \$8,889**

**11.9 Panel Reduction**

\*(9/watt)-CSI Incentive

-30% Federal Tax

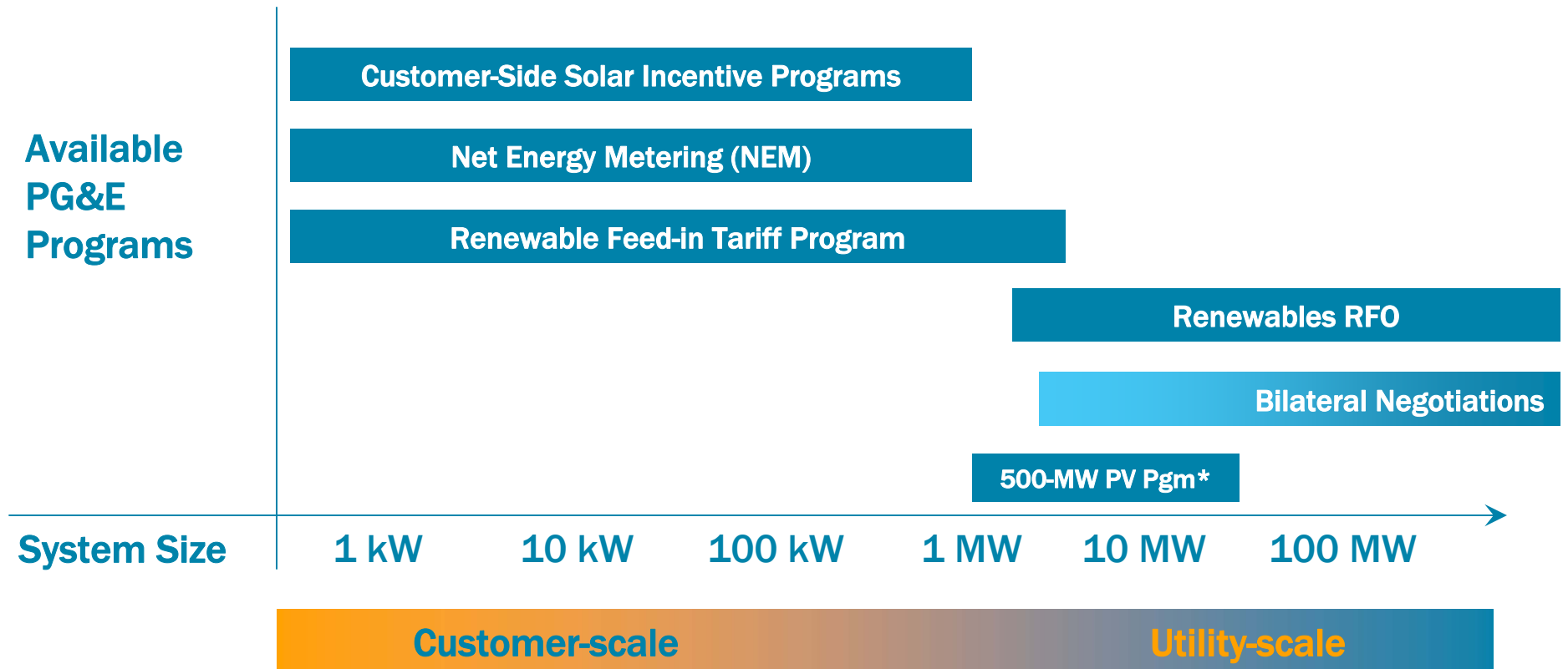


# PG&E Solar Programs



# PG&E Solar Programs

By system size



\* If approved by the CPUC



# PG&E Solar Programs

PG&E Program →	Customer-Side Solar Incentive Programs			Net Energy Metering (NEM)	Renewables Feed-in Tariff (FIT)	PG&E 500-MW PV Program *	Annual Renewables Request for Offers (RFO)
	California Solar Initiative (CSI)	Low-Income CSI Programs	New Solar Homes Partnership (NSHP)				
<b>What is it?</b>	An incentive program for customer-side solar, designed to help customers reduce on-site load	Incentive programs for customer-side solar specifically for low-income applications	An incentive program for customer-side solar for new residential developments	A tariff that permits customers to “bank” solar electricity produced that is in excess of instantaneous consumption	A multi-year standard contract with PG&E to provide renewable generation up to 3 MW	A program to install 250 MW of utility-owned solar and 250 MW of contracted solar (procured by PG&E via PPAs)	PG&E purchases eligible renewable energy resources to meet CA-mandated Renewable Portfolio Standard (RPS) goals, typically via Power Purchase Agreements (PPAs)
<b>Customer- or utility-side?</b>	Customer-side	Customer-side	Customer-side	Customer-side	Utility-side	Utility-side	Utility-side
<b>Eligible participants</b>	PG&E customers	PG&E customers	Housing developers in PG&E territory	PG&E customers	Renewable generators	Interested bidders	Interested bidders
<b>Eligible system sizes</b>	1 kW – 1 MW	1 kW – 1 MW	1 – ~5 kW	1 kW – 1 MW	Up to 3 MW	~1 to 20 MW	> 1.5 MW
<b>Financial opportunity</b>	Incentives from \$1.10 – 1.85/W (one-time, up-front payment) or \$0.15 – 0.26/kWh (paid monthly for 5 years)	Incentives vary; up to entire cost of PV system	\$2.50/W - \$3.60/W, depending on home’s efficiency	Retail rate for electricity supplied to grid; annual true-up period (no net export)	~\$0.10/kWh times adjustment (ranges from ~0.7 to 2.6)	~\$0.25/kWh times time of delivery adjustment	Varies
<b>References</b>	<a href="http://www.pge.com/csi">www.pge.com/csi</a> <a href="http://www.gosolarcalifornia.com">www.gosolarcalifornia.com</a> <a href="http://www.csi-trigger.com">www.csi-trigger.com</a>	<a href="http://www.pge.com/lowincomesolar">www.pge.com/lowincomesolar</a> <a href="http://www.gridalternatives.org/sash">www.gridalternatives.org/sash</a>	<a href="http://www.gosolarcalifornia.org/nsdp/index.html">www.gosolarcalifornia.org/nsdp/index.html</a>	<a href="http://www.pge.com/gen">www.pge.com/gen</a>	<a href="http://www.pge.com/b2b/energysupply/wholesaleelectric suppliersolicitation/standardcontractsforpurchase/in dex.shtml">www.pge.com/b2b/energysupply/wholesaleelectric suppliersolicitation/standardcontractsforpurchase/in dex.shtml</a>	<a href="http://docs.cpuc.ca.gov/published/proceedings/A0902019.htm">docs.cpuc.ca.gov/published/proceedings/A0902019.htm</a>	<a href="http://www.pge.com/renewablesrfo/">www.pge.com/renewablesrfo/</a>

\* If approved by the CPUC. Application filed on 2/24/09; anticipating CPUC decision in Q1 2010)



# Product-Related Opportunities with PG&E



# Customer-Scale Technologies

Product Stage	Idea/Concept	Pilot	Commercial
<b>Relevant PG&amp;E Programs or Departments</b>	<ul style="list-style-type: none"> <li>PG&amp;E Applied Technology Services (ATS)</li> <li>PG&amp;E Generation Interconnection Services (GIS)</li> </ul>	<ul style="list-style-type: none"> <li>PG&amp;E Applied Technology Services (ATS)</li> <li>PG&amp;E Generation Interconnection Services (GIS)</li> </ul>	<ul style="list-style-type: none"> <li>California Solar Initiative (CSI)</li> <li>New Solar Homes Partnership (NSHP)</li> <li>PG&amp;E Generation Interconnection Services (GIS)</li> </ul>
<b>Services or Opportunities Provided</b>	<ul style="list-style-type: none"> <li>Product testing, validation (ATS)</li> <li>Ensure product can interconnect safely with PG&amp;E grid (GIS)</li> </ul>	<ul style="list-style-type: none"> <li>Product testing, validation (ATS)</li> <li>Ensure product can interconnect safely with PG&amp;E grid (GIS)</li> </ul>	<ul style="list-style-type: none"> <li>Incentives for commercial products (CSI, NSHP)</li> <li>Enable interconnection with PG&amp;E grid (GIS)</li> </ul>
<b>Contacts/ Resources</b>	<ul style="list-style-type: none"> <li>ATS: Brent Patera (<a href="mailto:bxpl@pge.com">bxpl@pge.com</a>, 415-973-5335)</li> <li>GIS: <a href="mailto:gen@pge.com">gen@pge.com</a>, 415-972-5676</li> </ul>	<ul style="list-style-type: none"> <li>ATS: Brent Patera (<a href="mailto:bxpl@pge.com">bxpl@pge.com</a> or 415-973-5335)</li> <li>GIS: <a href="mailto:gen@pge.com">gen@pge.com</a>, 415-972-5676</li> </ul>	<ul style="list-style-type: none"> <li>CSI: <a href="http://www.pge.com/csi/">www.pge.com/csi/</a></li> <li>NSHP: <a href="http://www.gosolarcalifornia.org/nshp/index.html">www.gosolarcalifornia.org/nshp/index.html</a></li> <li>GIS: <a href="mailto:gen@pge.com">gen@pge.com</a>, 415-972-5676</li> </ul>





# Utility-Scale Technologies

Product Stage	Idea/Concept	Pilot	Commercial
<b>Relevant PG&amp;E Programs or Departments</b>	<ul style="list-style-type: none"> <li>PG&amp;E Applied Technology Services (ATS)</li> <li>PG&amp;E Generation Interconnection Services (GIS)</li> <li>PG&amp;E Emerging Clean Tech Policy (ECTP)</li> </ul>	<ul style="list-style-type: none"> <li>PG&amp;E Applied Technology Services (ATS)</li> <li>PG&amp;E Generation Interconnection Services (GIS)</li> <li>PG&amp;E Emerging Clean Tech Policy (ECTP)</li> </ul>	<ul style="list-style-type: none"> <li>Annual Renewables RFO</li> <li>Small Renewable Generation Feed-In Tariff</li> <li>PG&amp;E Generation Interconnection Services (GIS)</li> </ul>
<b>Services or Opportunities Provided</b>	<ul style="list-style-type: none"> <li>Product testing, validation (ATS)</li> <li>Ensure product can interconnect safely with PG&amp;E grid (GIS)</li> <li>Connections with vendors, system integrators interested in concept (ECTP)</li> </ul>	<ul style="list-style-type: none"> <li>Product testing, validation (ATS)</li> <li>Ensure product can interconnect safely with PG&amp;E grid (GIS)</li> <li>Connections with vendors, system integrators interested in concept (ECTP)</li> <li>Partnership for demonstrations, grants (e.g., CEC PIER, USDOE) (ECTP)</li> </ul>	<ul style="list-style-type: none"> <li>Electricity purchase agreements (RFO, SRGFIT)</li> <li>Ensure product can interconnect safely with PG&amp;E grid (GIS)</li> </ul>
<b>Contacts/ Resources</b>	<ul style="list-style-type: none"> <li>ATS: Brent Patera (<a href="mailto:bxpl@pge.com">bxpl@pge.com</a>, 415-973-5335)</li> <li>GIS: <a href="mailto:gen@pge.com">gen@pge.com</a>, 415-972-5676</li> <li>ECTP: Uday Mathur (<a href="mailto:UxM2@pge.com">UxM2@pge.com</a>, 415-973-2784)</li> </ul>	<ul style="list-style-type: none"> <li>ATS: Brent Patera (<a href="mailto:bxpl@pge.com">bxpl@pge.com</a>, 415-973-5335)</li> <li>GIS: <a href="mailto:gen@pge.com">gen@pge.com</a>, 415-972-5676</li> <li>ECTP: Uday Mathur (<a href="mailto:UxM2@pge.com">UxM2@pge.com</a>, 415-973-2784)</li> </ul>	<ul style="list-style-type: none"> <li>Renewables RFO: <a href="http://www.pge.com/renewablesrfo">www.pge.com/renewablesrfo</a></li> </ul>





## PG&E Resource – Generation Interconnection Services (GIS)

- Solar systems must be approved for interconnection by PG&E before interconnecting to the PG&E grid
  - Includes interconnections on the customer side of the meter
  - GIS facilitates the interconnection process
- For Net Energy Metering (NEM) projects, interconnection requirements of “Rule 21” must be met
  - Rule 21: <http://www.pge.com/tariffs/pdf/ER21.pdf>
  - GIS facilitates meeting these requirements
- Interconnecting equipment must be certified to applicable standards
  - Example: Inverters must be certified to UL 1741
- For net export projects whose output is scheduled by the California Independent System Operator (CALISO), interconnection requirements are governed by the Federal Energy Regulatory Commission (FERC)
- GIS contact information: [gen@pge.com](mailto:gen@pge.com), 415-972-5676



## PG&E Resource – Emerging Clean Tech Policy (ECTP)

- Investigates commercially viable, clean, primarily utility-scale generation technologies
- PG&E is most directly interested in commercial-ready technologies that can be deployed today
- If the technology/product is not commercially ready, ECTP can assist by:
  - Providing referrals to other vendors/developers who may be interested in the technology
  - Jointly participating in demonstrations, grant responses, or similar projects
- ECTP contact
  - Uday Mathur: [UxM2@pge.com](mailto:UxM2@pge.com) or (415) 973-2784



## PG&E Resource – Applied Technology Services (ATS)

<b>What is ATS?</b>	<ul style="list-style-type: none"><li>• A multidisciplinary team of 100 engineers, scientists, and technicians committed to delivering practical <b>testing, diagnostic</b> and <b>analytical</b> solutions to your most challenging engineering problems.</li><li>• ATS services are delivered in the field or from PG&amp;E's fully equipped San Ramon Technology Center.</li></ul>
<b>ATS capabilities</b>	<ul style="list-style-type: none"><li>• Electrical, Mechanical, Thermal &amp; Meteorological Disciplines</li><li>• Performance measurement &amp; evaluation</li><li>• Failure Analysis</li><li>• Ultrasonic and Radiographic Imaging</li><li>• Recommendations for technical improvement</li><li>• Extensive experience in test development and data analytics</li></ul>
<b>Solar-specific capabilities</b>	<ul style="list-style-type: none"><li>• Direct Substation/Grid Attachment</li><li>• Existing testing infrastructure including sensors, data acquisition &amp; connectivity</li><li>• Flexible loading capabilities</li><li>• Roof and Ground-Mounting Capacity</li></ul>
<b>Benefits for solar development</b>	<ul style="list-style-type: none"><li>• Quick Test Set-Up</li><li>• Unique direct grid access</li><li>• Experienced testing personnel</li><li>• Confirm performance during development</li><li>• <b>Avoid mistakes and delays</b></li><li>• <b>Shorten Development Cycle</b></li><li>• <b>Professional input for design enhancement</b></li></ul>

**Example: Inverter testing**

- Wide range of inverters from industry
- Load development & grid attachment
- Test interconnection and behavior
- Established standards for inverter operation including “anti-islanding”

**Brent Patang** (bxpl@pge.com  
or 415-265-7232)



# Product Certification Requirements



## Product Certification Requirements

### Product certification

- Equipment must be certified by an Nationally Recognized Testing Laboratory (NRTL) capable of testing to the applicable standards
- List of NRTLs
  - <http://www.osha.gov/dts/otpca/nrtl/index.html#nrtls>

### CSI eligibility

- To be listed as CSI-eligible, manufacturer must submit NRTL certification *plus* other required documents/documentation
- Additional information and required paperwork available online
  - <http://www.gosolarcalifornia.org/equipment/index.html>

### Product validation

- Additional performance testing and validation is available through PG&E's Applied Technology Services (ATS)
- Contact PG&E's Brent Patera at [bxpl@pge.com](mailto:bxpl@pge.com) or (415) 973-5335 for more information



## Product Certification Requirements – CSI

	PV Module	Other Solar Technology	Inverter	Meter
<b>Applicable Standard</b>	UL 1703	Full safety certification with follow-up service or listing by a NRTL	UL 1741 + performance testing by UL 1741-certified NRTL	For performance based incentives, must be +/- 2% accurate; +/- 5% otherwise
<b>Capable NRTLs</b>	UL, CSA, Intertek	Depends on technology and applicable standard(s)	UL, CSA, Intertek, MET Laboratories, TUV America, TUV Rhineland of North America	UL, CSA, Intertek, MET Laboratories, TUV America, TUV Rhineland of North America
<b>Additional Notes</b>	Beginning 7/1/09, additional performance testing by an ILAC affiliated laboratory is also required	If existing standards do not apply, may require development of new test protocol	In addition to CEC equipment application form, manufacturer must also submit the <i>weighted inverter efficiency form</i>	Beginning 1-1-10, inverter-integral meters must be <b>certified</b> to 5% accuracy
<b>For additional information</b>	CSI equipment eligibility website: <a href="http://www.gosolarcalifornia.org/equipment/index.html">www.gosolarcalifornia.org/equipment/index.html</a>			



## Product Certification Requirements – CSI

### Sample Sequence (Customer-Scale Technology)





# External Resources

Resource	Link	What's available
U.S. Department of Energy	<a href="http://www.energy.gov">www.energy.gov</a>	Grants, information, etc.
National Renewable Energy Laboratory	<a href="http://www.nrel.gov">www.nrel.gov</a>	Publications, demonstration opportunities, etc.
California Energy Commission	<a href="http://www.energy.ca.gov">www.energy.ca.gov</a>	Publications, grants, information
Public Interest Energy Research (PIER), CEC	<a href="http://www.energy.ca.gov/research/index.html">www.energy.ca.gov/research/index.html</a>	Grants, research opportunities
Database of State Incentives for Renewable Energy (DSIRE)	<a href="http://www.dsireusa.org">www.dsireusa.org</a>	State and federal incentives for renewable energy
FERC (interconnection requirements)	<a href="http://www.ferc.gov/industries/electric/industry-act/gi.asp">www.ferc.gov/industries/electric/industry-act/gi.asp</a>	Interconnection agreements & procedures for large generators
Solar Electric Power Association (SEPA)	<a href="http://www.solarelectricpower.org">www.solarelectricpower.org</a>	Industry association focusing on utility-scale solar
California Solar Energy Industries Association (CalSEIA)	<a href="http://www.calseia.org">www.calseia.org</a>	Industry association focusing on customer-scale solar



# Thank you!

## Your thoughts?

- Suggestions for future content?
- Opinions on content and delivery?
- Topics to emphasize or de-emphasize?
- How can we provide a better service?



**Feedback is welcomed!**

**[mgh9@pge.com](mailto:mgh9@pge.com)**