
PG&E's 500 MW Solar Photovoltaic Program

4/27/2009



Agenda

- I. Overview of Photovoltaic Utility-Owned Generation (PV UOG) Program [*1 hour*]
- II. Overview of Photovoltaic Power Purchase Agreement (PV PPA) Program [*45 minutes*]
- III. Break [*15 minutes*]
- IV. Overview of Ratemaking [*30 minutes*]
- V. Prehearing Conference Process Discussion [*45 minutes*]

Workshop Ground Rules

- Purpose is to provide information on proposed program and answer questions
- Will not be able to provide confidential information
- Questions at the end of each section, time permitting

PV Program Overview

500 MW PV Program

Integrated Utility/IPP Solar Program

(Filed on 2/24/09; Anticipating CPUC decision in Q4 2009)

250 MW UOG

- 100% Utility Owned
- Typically 1-20 MW in size
- Estimated weighted average cost cap of ~\$4,275 / kW DC
- PG&E to hold competitive solicitations for equipment and services

250 MW PPA

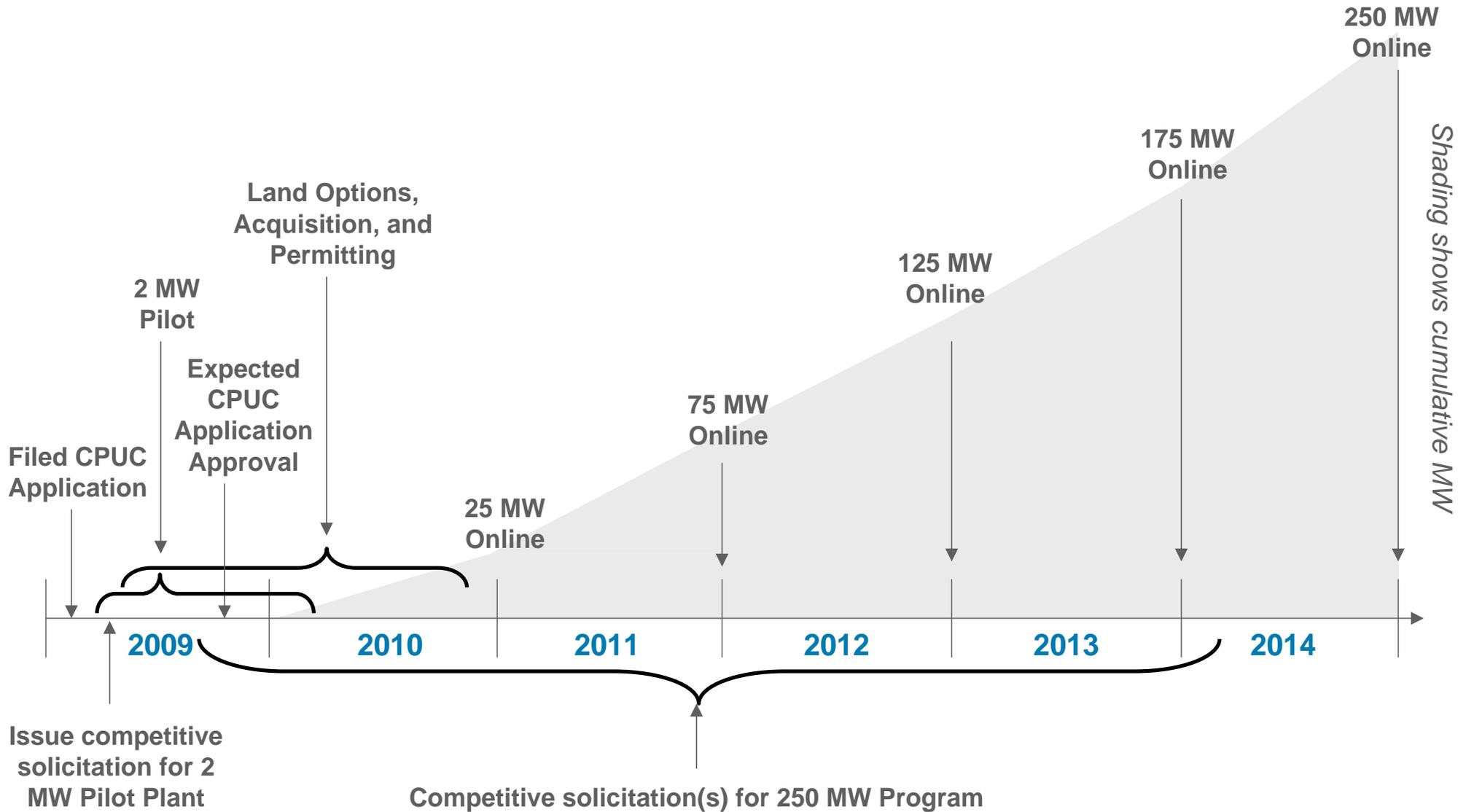
- 100% PPA
- 1-20 MW in size
- Proposed price for 2010 RFO of \$246/mwh, subject to Time-of-Day delivery adjustment
- PG&E to hold RFOs annually

PV UOG Program - Overview

Program Overview

- 250 MW of solar photovoltaic utility-owned generation (UOG)
 - 25 MW installed in 2010, 50 MW in 2011, 2012, and 2013, 75 MW in 2014
 - Aid in RPS compliance
- Individual project size: typically 1 - 20 MW
 - Accelerated timeline for deployment
 - PV technology: modular in nature
 - Uses the Small Generation Interconnection Procedures (SGIP)
 - Short build time for projects (< 6 months)
- Estimated weighted average cost cap of ~\$4,275 / kw DC
- Location: PG&E service territory

Deployment Timeline



The Competitive Solicitation Process

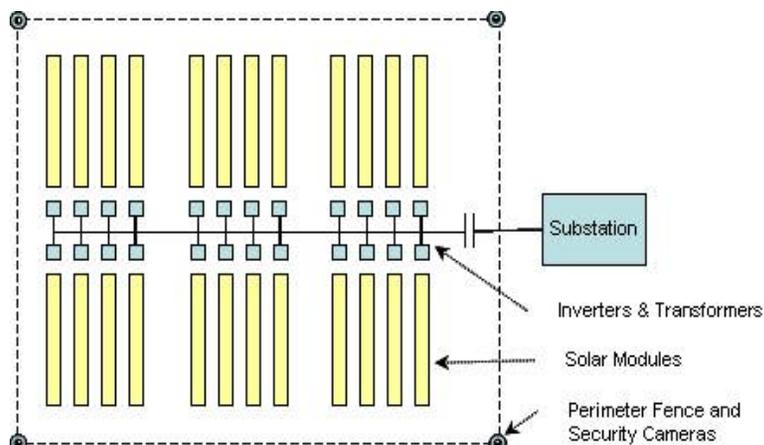
- PG&E will run competitive solicitations for equipment and construction services (both bundled turnkey and unbundled EPC bids)
 - 2 MW Pilot Project
 - Supplier outreach events have been conducted for the solicitation
 - Solicitation was issued in mid March and over 160 suppliers invited
 - Six bidders prequalified for the 2 MW Pilot solicitation scheduled for May 2009
 - 1st 250 MW solicitation (*late summer / early fall 2009*)
 - A separate solicitation will be issued to shortlist qualified suppliers for the 250MW Program
 - Open for all bidders to resubmit
 - Follow-on solicitations
 - Depends on result of 1st solicitation
 - PG&E will examine bids and reserves the right to select all 250 MW from the 1st solicitation, or may hold follow-on solicitations
- Short-list selection will be based on a combination of qualitative and quantitative factors as specified in different categories
 - Technical Capabilities
 - Commercial Viability
 - Supplier Diversity

Site Selection & Land Acquisition

Photovoltaic Field



Typical MW-Scale Photovoltaic Installation



- Approximately 7 -10 acres of land are required per MW, and additional land may be required for environmental mitigation
 - Rows of modules (left), called strings, are connected to an inverter, which can produce about 500 kW of power
 - The inverters are connected to a step up transformer, which then connects to the power grid
- PG&E intends to place land deposits ahead of CPUC approval of the Solar PV Program
 - Will allow PG&E to start the permitting process
 - Will enable more timely deployment of the program upon CPUC approval
- Site selection criteria:
 - Insolation
 - Slope (less than 5%)
 - Cost of interconnection
 - Environmental impact
 - Local transmission constraints
 - Cost of land
 - Biological, cultural, visual resource issues
- Focus will be on ground-mount systems but PG&E may pursue some roof-mount systems if economical

PV UOG Program - Capital Cost Summary

Capital Cost Estimate – Assumptions

- **General**

- PG&E assumed 5 MW average project size per site (10 acres per MW)
- Fixed tilt, ground-mounted systems on flat, already-disturbed agricultural land
- Fresno location
- Annual degradation rate of 0.89% per year (equal to 80% production at 25 years / standard warranty)

- **PV System Contract Cost**

- Total system cost reflects bundled (turnkey), engineering design, equipment procurement and construction (EPC) contracts
 - Equipment estimates based on indicative prices from PV vendors received in the summer of 2008
 - Construction costs based on prevailing wage costs
- Equipment includes PV panels, mounting racks, inverters, transformers, combiner boxes, fuse boxes, fuses, DC string wiring, AC system wiring, and a performance monitoring system

Capital Cost Estimate – Assumptions *(continued)*

- **Land Acquisition, Site Preparation and Permitting**
 - PG&E assumed it would need 10 acres of land per MW
 - Will target high insolation areas near PG&E substations
 - Land cost based on recent sales prices for Central Valley crop land
 - Site preparation and permitting costs based on results of preliminary due diligence
 - Review by PG&E Geosciences department; surveys of 12 potential sites
- **Grid Interconnection**
 - Interconnection costs depend on configuration of substation, feeder, interconnection point, and project size
 - PG&E estimate assumes a mix of project interconnection configurations
- **Security and SCADA**
 - Based on internal estimates
 - Costs scaled to match expected solar field dimensions, locations, and data requirements

Capital Cost Estimate – Assumptions *(continued)*

- **PG&E Supervisory Labor, Consulting Support, and Permits**
 - Reflects labor and consulting support to supervise activities for land acquisition, environmental due diligence and permitting, site preparation and design, procurement and construction
 - Also includes cost for fees, permits, and implementation of permit terms and conditions
- **Contingency**
 - Varies depending on cost element
 - 10% for turnkey solar field
 - 33% for land acquisition and permitting
 - 20% for grid interconnection
 - 18% for security / SCADA
 - 15% for site preparation

Capital Cost Estimate (\$ / kW DC)

**TABLE 4-1
CAPITAL COST ESTIMATE
PV UOG PROGRAM
\$2009/kilowatt (kW) Direct Current (DC)(a)**

Line No.	Program Cost Element	2010	2011	2012	2013	2014	Weighted Average
1	PV System Contract	3,605	3,334	3,108	2,943	2,884	3,103
2	Land Acquisition, Site Preparation and Permitting	270	268	265	262	259	264
3	Grid Interconnection	238	234	229	224	219	227
4	Security and SCADA	161	158	155	152	149	154
5	PG&E Supervisory Labor and Consulting	174	87	87	87	48	84
6	Subtotal	4,448	4,081	3,843	3,667	3,559	3,831
7	Contingency	499	470	445	427	419	444
8	Total Project Cost	4,947	4,551	4,288	4,094	3,979	4,275

(a) Costs are presented in year 2009 dollars.

PV UOG Program - Operations And Maintenance

Operations and Maintenance Overview

- **Basis of Design and Cost Assumptions:**
 - 250 MW Utility-Owned-Generation program:
 - 5 MW standard design
 - Ground mounted
 - Fixed panels
 - 25 MW installed in 2010, 50 MW in 2011, 2012, and 2013, 75 MW in 2014
 - Actual installations are likely to vary in size from the 5 MW basis
 - Amount of MW installed each year may vary so O&M costs were also expressed in terms of \$ / kW-yr.
- **What is included in O&M?**
 - PG&E Labor and Preventive Maintenance
 - Corrective Maintenance
 - Safety/Security/Compliance
 - Infrastructure
 - Consumables and Materials
 - Contracts
 - Contingency

Operations and Maintenance Detail

PG&E Labor and Preventive Maintenance

Eight additional personnel at full build out—contract management, monitoring, inspections, calibration, minor maintenance.

Corrective Maintenance

Diagnose equipment problems and facilitate repair of warranty covered equipment.

Safety/Security/Compliance

Safety supplies, equipment and training and security system maintenance

Infrastructure

Pest control, weed abatement, dust suppression, perimeter fencing, communication and data acquisition software and hardware upgrades.

Consumables and Materials

Inverter air filters, connectors, non-warranty covered components.

Contracts

Panel washing and vendor service agreements for equipment not covered under warranty.

Contingency

Operations and Maintenance Costs

**TABLE 5-1
PACIFIC GAS AND ELECTRIC COMPANY
O&M COSTS INCLUDING CONTINGENCY
(2009 THOUSAND DOLLARS)**

Line No.	Year of Operation	First	Second	Third	Fourth	Fifth
1	PG&E Labor and Preventive Maintenance	619	889	1,159	1,428	1,833
2	Corrective Maintenance	31	94	157	220	315
3	Safety/Security/Compliance	29	87	146	204	291
4	Infrastructure	153	460	767	1,074	1,534
5	Consumables and Materials	6	17	28	39	55
6	Contracts	250	750	1,250	1,750	2,500
7	Contingency	218	459	701	943	1,306
8	Total O&M Including Contingency	1,306	2,756	4,207	5,657	7,833

Operations and Maintenance Costs *(continued)*

**TABLE 5-3
PACIFIC GAS AND ELECTRIC COMPANY
O&M COSTS INCLUDING CONTINGENCY
(\$2009/KW-YR)**

<u>Line No.</u>	<u>Year of Operation</u>	<u>First</u>	<u>Second</u>	<u>Third</u>	<u>Fourth</u>	<u>Fifth</u>
1	Annual O&M (\$/kW-yr) AC	52.24	36.75	33.66	32.33	31.33

2 MW Pilot Operations and Maintenance

- **Basis of Design and Cost Assumptions:**

2 MW UOG Pilot:

- 2 MW
- Ground mounted
- Fixed panels

Same estimating methodology as was used for the 250 MW program.

**TABLE 5-4
PACIFIC GAS AND ELECTRIC COMPANY
PV PILOT O&M COSTS INCLUDING CONTINGENCY
(2009 THOUSAND DOLLARS)**

Line No.	Year of Operation	First	Second	Third	Fourth	Fifth
1	Total O&M Including Contingency	369	369	369	369	369

PV PPA Program Overview

Program Overview

- **Timing:**
 - 5 annual Request for Offers (RFO), up to 50 MW each
 - First RFO to be conducted in early 2010 after CPUC approval of PV program
 - Subsequent RFOs conducted annually
- **Contract:**
 - Non-negotiable standard form PPA based on PG&E's proposed 2009 Renewable Energy Procurement Plan PPA
 - 2009 RPS PPA to be finalized in June/July 2009 depending on timing of CPUC decision approving 2009 RPS Plan
- **Pricing:**
 - Sellers to be awarded 20 year PPAs at fixed price based on estimated UOG costs
 - Proposed price for 2010 RFO of \$246/mwh, subject to Time-of-Day delivery adjustment

Request For Offers (RFO) Selection Criteria

- Selection based on combination of quantitative and qualitative factors
- Quantitative evaluation
 - Market valuation (based on location and generation profile)
- Qualitative evaluation
 - Project viability – ability to bring project online within 18 months of final approval
 - Consistency with RPS goals

Project Viability

PG&E's primary selection criterion is the ability for the Seller to complete its PV project and deliver RPS-eligible energy

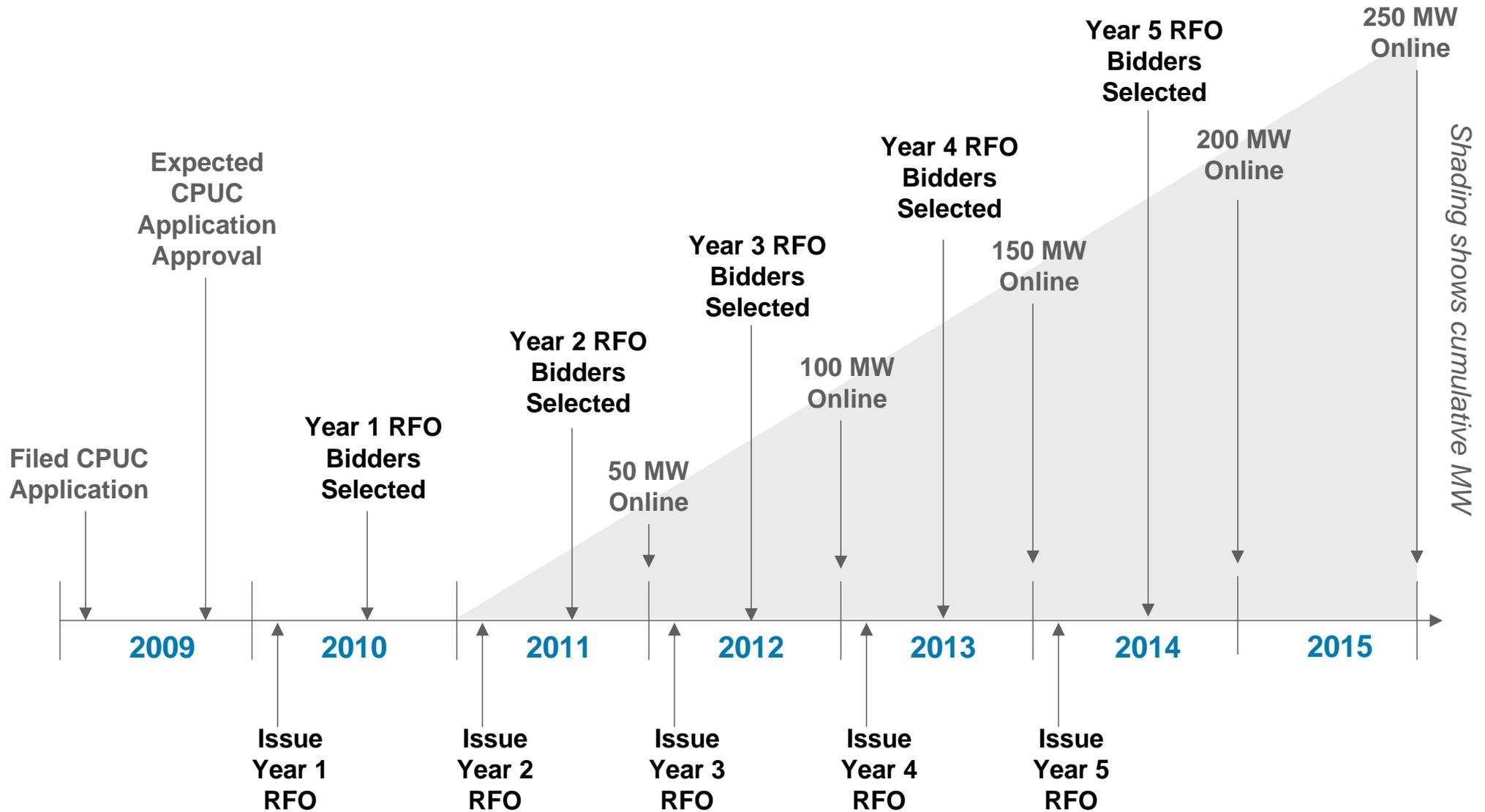
- **Developer Experience**
 - Previously developed projects? Developed in CA?
 - Financing capability
- **Technical Viability**
 - Proven vs. unproven technology
- **Project Status**
 - Permits
 - Status of Transmission/Distribution Interconnection
 - Site Control

Illustrative PPA RFO Schedule

Q4 2009	CPUC approval of PV Program
January 2010	PG&E Updates/Finalizes PPA documents consistent w/CPUC decision
February 2010	PG&E issues RFO
April 2010	Bids due
July 2010	Winning bidders selected
August 2010	PPA contracts approved by CPUC
18 Months after final approval, strong preference by December 2011 for first phase	Deadline for PV projects to be online

* Timing is subject to change based on timing of CPUC regulatory approval

PPA Deployment Timeline



Break

Ratemaking - Overview

Revenue Requirement for 250 MW UOG Program

- Developed Total Revenue Requirement for Each Program Year
- Developed per-MW Revenue Requirement for Each Program Year
- PG&E will be Allowed to Recover \$/MW for the average MW Installed in a Program Year
- Assumes O&M and Capital Expenditures Discussed Above
- Reflects PG&E's Authorized Cost of Capital with 1% adder for Renewable Projects

**TABLE 6-3 (REVISED) (1)
PACIFIC GAS AND ELECTRIC COMPANY
250 MW PV UOG PROGRAM
AVERAGE \$/MW BY PROGRAM YEAR
(THOUSANDS OF NOMINAL DOLLARS)**

Line No.	Program Year(a)	2010	2011	2012	2013	2014
1	2010 Projects	1,085	906	843	785	738
2	2011 Projects		1,004	849	792	738
3	2012 Projects			967	819	765
4	2013 Projects				943	800
5	2014 Projects					935

(1) The table in the testimony was incorrect. We will correct when we file errata.

Ratemaking for 250 MW UOG Program

- Establishes Annual Capital Cost Targets in 2009 \$/kW DC
- Ask that the Commission Find These Targets Reasonable
- If Actual Capital Costs are Below the Weighted Average of the Targets PG&E Recovers Actual Capital Revenue Requirement without Further Commission Review
- If Actual Capital Costs are below the Weighted Average of the Targets, PG&E will True up to Lower Amount at End of Program
- If Capital Costs are Above the Weighted Average of the Targets, PG&E Collects only up to this amount unless Found Reasonable by CPUC
- Revenues will roll into General Rate Cases after Program is Complete

Capital Cost of 250 MW UOG Program

- Total Capital Expenditures Derived from Capital Targets
- Total Cost \$1.45 Billion

**TABLE 6-9
PACIFIC GAS AND ELECTRIC COMPANY
DEVELOPMENT OF PV PROGRAM CAPITAL EXPENDITURES**

	2010	2011	2012	2013	2014	
\$/kW 2009\$ DC	4,448	4,081	3,843	3,667	3,559	
Contingency	499	470	445	427	419	
\$/kW Target 2009\$ DC	4,947	4,551	4,288	4,094	3,979	
Escalation	77	159	251	333	411	
\$/kW Nominal \$	5,025	4,710	4,539	4,426	4,389	
DC/AC Conversion	1,103	1,034	996	972	963	
\$/kW Nominal \$ AC	6,128	5,744	5,535	5,398	5,353	
Overheads	300	270	261	255	249	
\$/kW Nominal AC	6,427	6,014	5,796	5,653	5,601	
Capacity (in MW)	25	50	50	50	75	
Total Capital Expenditures(a)	160,685	300,712	289,824	282,665	420,094	= 1,453,979

In Thousands of Dollars

Renewable Tax Credits for 250 MW UOG Program

- Revenue Requirements reflects 30% Investment Tax Credit
- Also Assumes 5-year Federal Accelerated Tax Depreciation
- Follows IRS Rules for Tax Normalization
- Rate Base is Reduced by ITC Amount resulting in Reduced Revenue Requirement – Rate Base Deduction reduced Year-by-Year over Life of Program
- Rate Base is Reduced by Difference Between Book and Tax Depreciation, further lowering Revenue Requirement.

Ratemaking for 250 MW PPA Program

- PPA costs will be collected through Energy Resource Recovery Account (ERRA) consistent with how PG&E collects procured energy costs.

Pre-Hearing Conference Discussion

Revised Schedule

Event	Interval	Date
Application Filed (Notice appears in Daily Calendar)		Filed February 24, 2009 Noticed February 25, 2009
Protest, Response	30	March 27, 2009
Workshop		April 27, 2009
Prehearing Conference		May 14, 2009
Commissioner's Scoping Memo	14	May 28, 2009
Intervenor Testimony	21	June 18, 2009
Concurrent Rebuttal Testimony	14	July 2, 2009
Concurrent Opening Briefs	21	July 23, 2009
Concurrent Reply Briefs	14	August 6, 2009
Proposed Decision	46	September 21, 2009
Opening Comments on PD	20	October 13, 2009
Reply Comments on PD	5	October 18, 2009
Commission Approval		October 29, 2009

Scope

- Whether to approve the proposed PG&E PV Program as proposed?
- Whether the proposed PG&E PV Program is reasonable in light of the costs and the benefits?
- Whether to approve PG&E's proposed cost recovery mechanism, including the 1% adder for renewables?