

DOCKETED

Docket Number:	16-IEPR-05
Project Title:	Electricity Demand Forecast
TN #:	211941
Document Title:	Presentation - Behind the Meter Solar PV in CA Load Forecasting and Planning
Description:	Melanie McCutchan, Pacific Gas and Electric
Filer:	Raquel Kravitz
Organization:	PG&E
Submitter Role:	Public
Submission Date:	6/22/2016 4:06:27 PM
Docketed Date:	6/22/2016

Behind the Meter Solar PV in CA Load Forecasting and Planning

2017 California Integrated Energy Policy Report (IEPR) Demand Forecasting Workshop

June 23, 2016

Melanie McCutchan, Policy & Strategy Analyst

mym6@pge.com

Distributed Generation Policy & Strategy
Customer Energy Solutions
Customer Care





Outline

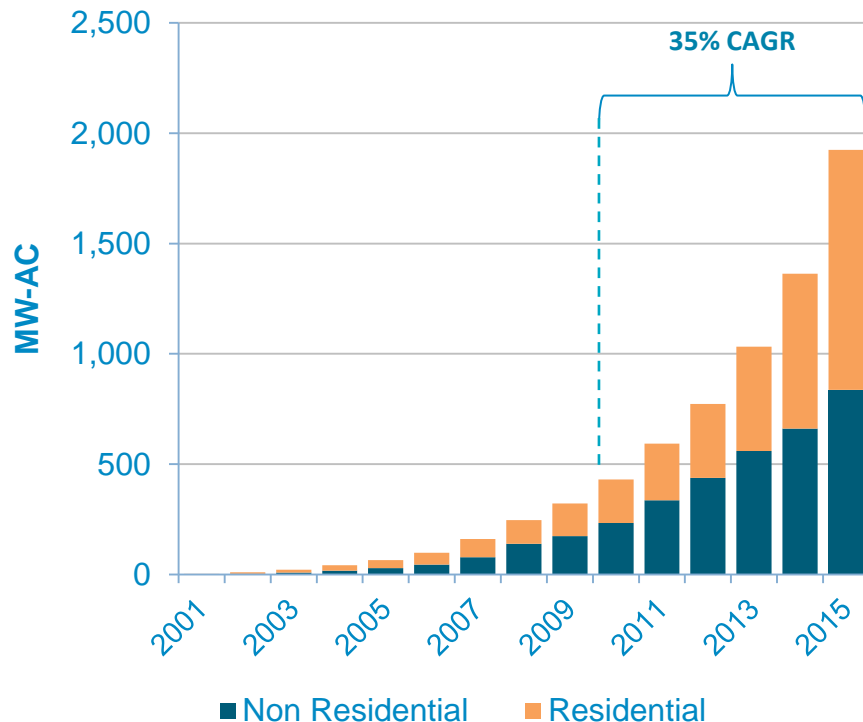
1. BTM PV adoption is growing rapidly and already having material impacts on system load
2. PG&E has invested in tools to improve our incorporation of BTM PV into load forecasting and system planning
3. Gaps in understanding in PV technology adoption patterns and load impacts may hinder efficient system planning
4. CEC/CPUC/CAISO should invest in improved tools and information for incorporating BTM solar into load forecasting and system planning



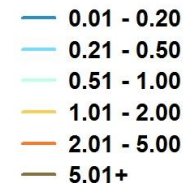
Retail Solar Growth- PG&E Service Area

- PV adoption has grown in PG&E's service area at a CAGR of 35% over the last five years
- Growth has been clustered, with certain neighborhoods and regions seeing more adoption than others

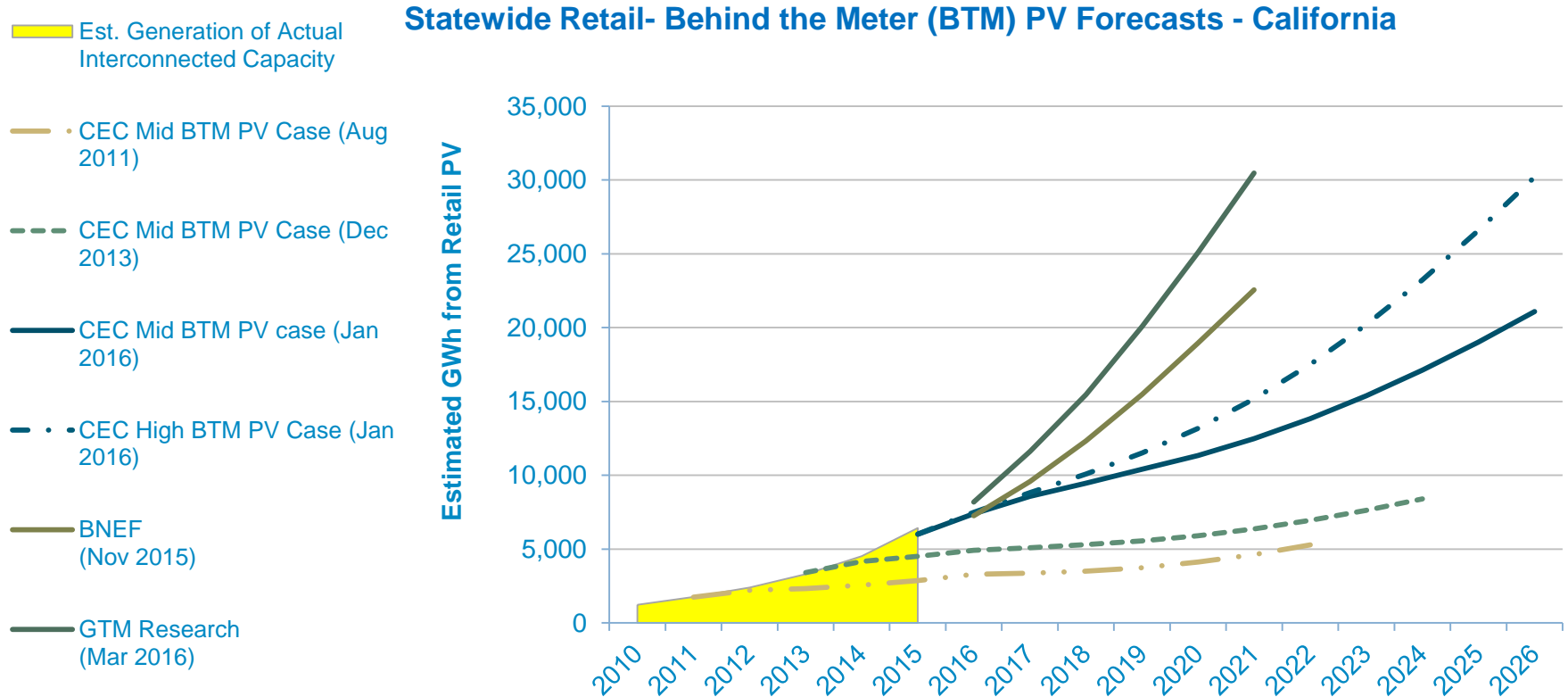
Cumulative Customer Solar Capacity



Year 2014
Interconnected PV
by Feeder (MW-AC)



Growth in Retail Solar has Exceeded Expectations and Projections Vary



Sources:

CEC Forecasts:

2011 CED for IEPR http://www.energy.ca.gov/2011_energypolicy/documents/2011-08-30_workshop/mid-case/

2013 CED for IEPR http://www.energy.ca.gov/2013_energypolicy/documents/#adoptedforecast

2015 CED for IEPR http://www.energy.ca.gov/2015_energypolicy/documents/index.html#adoptedforecast

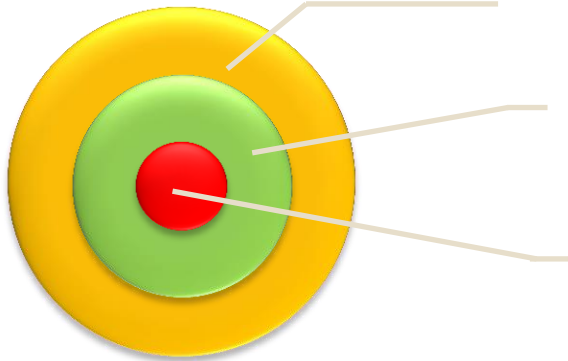
BNEF: H2 2015 US PV Market Outlook Nov 9, 2015

GTM: 2015 Year-in-Review March 9, 2016



PG&E's PV Adoption Modeling Approach

1) Estimate "Market Potential" for Retail PV by Customer Class



A. Technical Potential

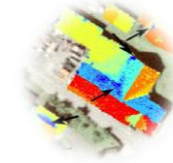
Assess viable surface area for retail PV

B. Economic Potential

Determine customers who will be "in the money"

C. Market Potential

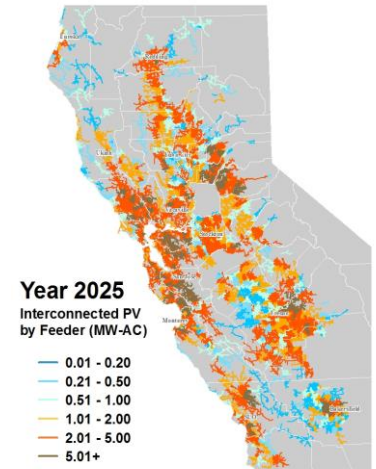
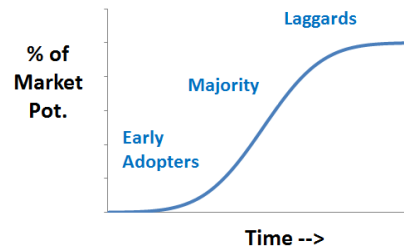
Account for other constraints on adoption, such as home ownership



2) Estimate rate of adoption using a Bass Diffusion Modeling framework

3) Account for policy and market uncertainty, develop distribution of possible outcomes

4) Allocate system-level forecast to a feeder level for distribution planning using "propensity to adopt" scores estimated through logistic regression



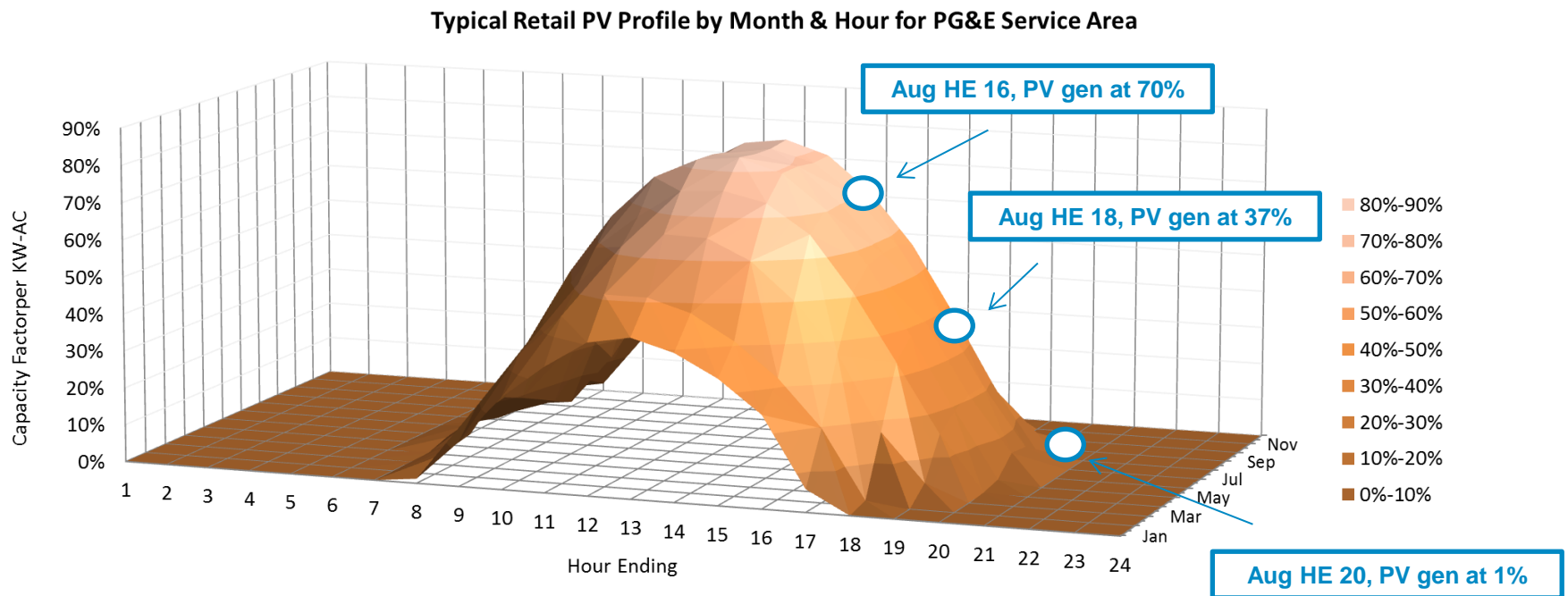
Year 2025
Interconnected PV
by Feeder (MW-AC)

0.01 - 0.20
0.21 - 0.50
0.51 - 1.00
1.01 - 2.00
2.01 - 5.00
5.01+



Estimating BTM PV's Impact on Load

- PG&E developed BTM solar generation profiles using interconnection data and NREL's PV Watts generation estimates for long-term forecasting
- These profiles have helped PG&E model long-term changes to hourly system load
- PG&E's Meteorology team is developing more geographically granular estimates and examining variability in generation
- Better understanding of customers' gross consumption patterns after installing solar needed
- Better estimates for the relationship between temperature and BTM solar production would improve generation estimates

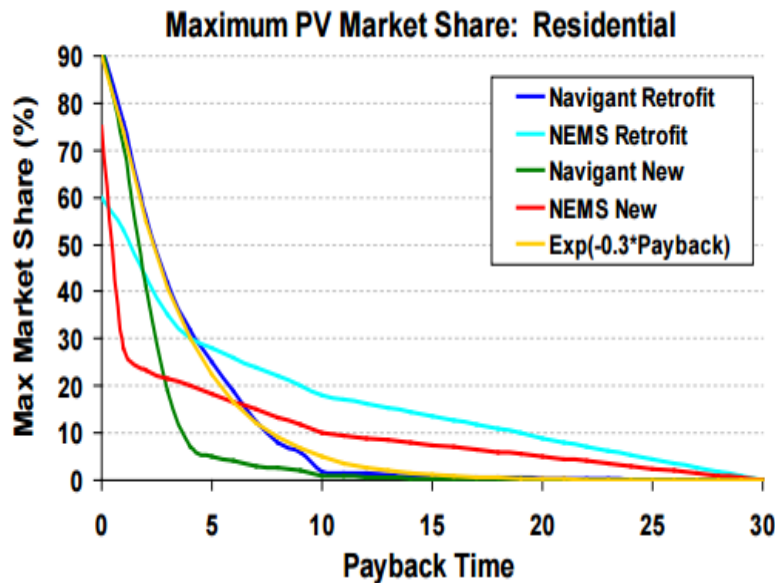


Gaps in Tools and Information & Challenges in BTM PV Forecasting

- Customer responsiveness to solar cost-effectiveness

“Market Share Curves” commonly used in PV adoption modeling appear to underestimate economic potential

(a) NREL’s Solar DS Model (Sep 2009)



(b) NREL’s new DGen Model (Feb 2016)

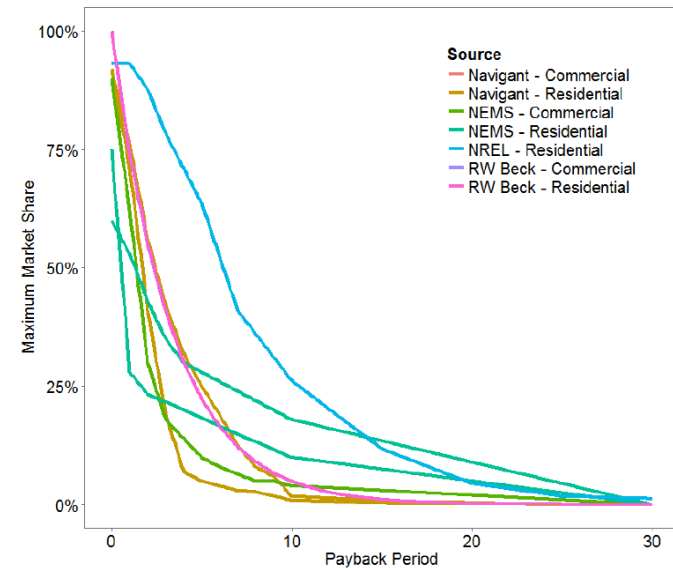


Figure 6. Maximum market share as a function of payback period based on different sources

Sources: R.W. Beck 2009; EIA 2004; Paidipati et al. 2008; Sigrin and Drury 2014
(NEMS = National Energy Modeling System)

a) NREL’s SolarDS Model Documentation at page 19 <http://www.nrel.gov/docs/fy10osti/45832.pdf>

b) NREL’s DGen Model page 23 at: <http://www.nrel.gov/docs/fy16osti/65231.pdf>



Gaps in Tools and Information & Challenges in BTM PV Forecasting (Cont'd)



- Customer responsiveness to solar cost-effectiveness
- Consumption patterns after solar adoption
- Complex Current, and Uncertain Future Rate Design

- CEC/CPUC/CAISO/Utilities should pursue opportunities to improve retail PV forecasting tools & information
- CSI M&E funds are a potential source of funding



Key Takeaways

1. BTM PV adoption is growing rapidly and already having material impacts on system load
2. PG&E has invested in tools to improve our incorporation of BTM PV into load forecasting and system planning
3. Gaps in understanding in PV technology adoption patterns and load impacts may hinder efficient system planning
4. CEC/CPUC/CAISO should invest in improved tools and information for incorporating BTM solar into load forecasting and system planning