2018 IEPR Forecast Overview: Behind-the-Meter Photovoltaic Systems

Sudhakar Konala

Demand Analysis Office

Energy Assessments Division

Sudhakar.Konala@energy.ca.gov

Overview

- ❑ Review Data Sources
- ❑ Describe Energy Commission PV Modeling
- ❑ Review of 2017 IEPR PV Forecast
- ❑ Recent Trends and Overview of 2018 PV Update

Background: Data Sources

- Build a comprehensive dataset combining all available sources of PV data.

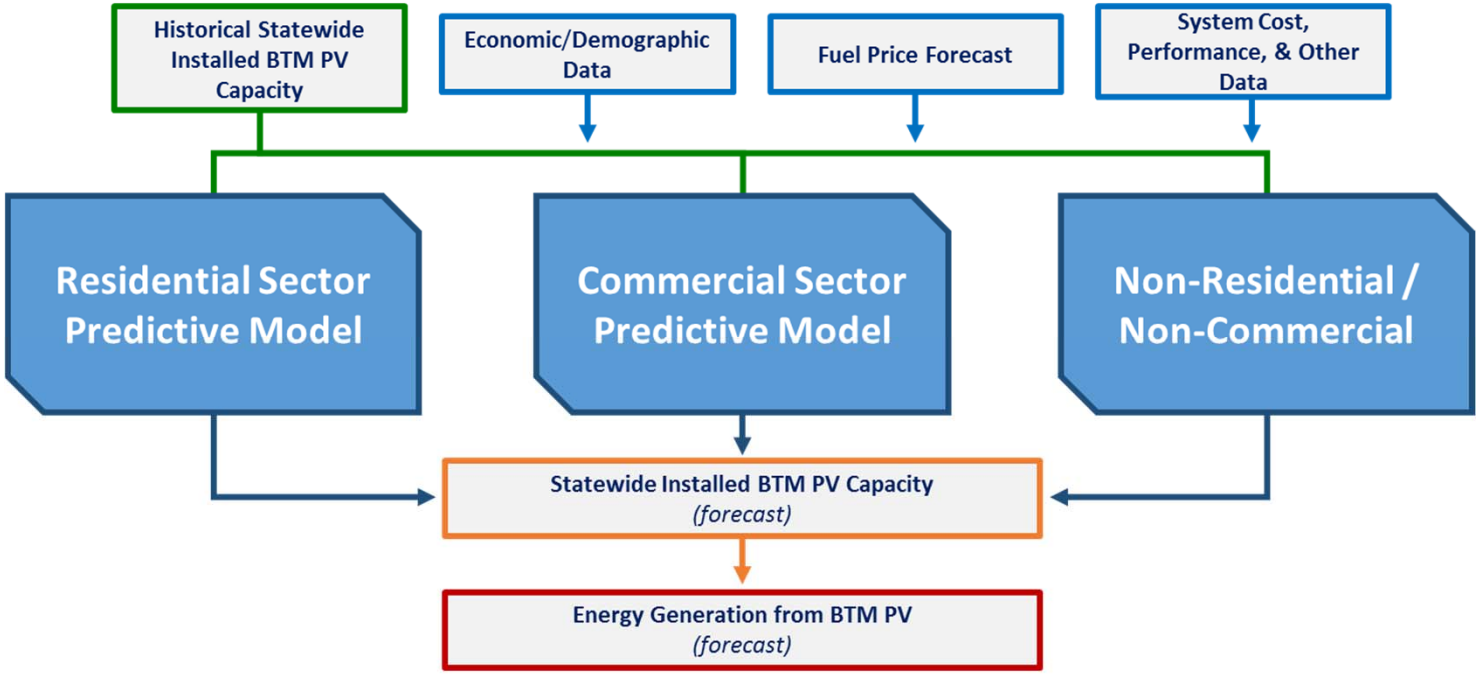
- Example: Calculate installed PV capacity using…
  - ❑ Interconnection Data
    - ❑IEPR Form 1.8 Utility Interconnection Filings
    - ❑NEM Currently Interconnected Data Set
  - ❑ Solar Incentive Program Data
    - ❑California Solar Initiative
    - ❑Self-Generation Incentive Program (SGIP)
    - ❑New Solar Homes Partnership (NSHP)
    - ❑Emerging Renewables Program (ERP)
    - ❑SB1 POU Program Data

NOTE: Depending on the year, different sources of data for PV may be used.

Processing Historical PV Data

- Process historical data on PV projects → create final dataset which maps every record from the raw data to include the following information:
  - Technology size (kW)
  - Installed cost and rebate data at project level if available
  - Sector and subsector (if NAICS/SIC is available)
  - County
  - Electric utility
  - Energy Commission electric utility planning area/forecast zone
  - Date installed
- Aggregate data
  - By Forecast Zone and Sector

Energy Commission PV Model



- Residential and commercial models predict PV penetration based on calculated payback / bill savings.

Forecasting PV Capacity

Residential & Commercial Sectors

- Determine maximum market share

$$Maximum\ Market\ Share = e^{-Payback\ Sensitivity * Payback}$$

IRR ≥ 5%	IRR < 5%
$Payback = \frac{log\ 2}{\log(1 + IRR)}$	$Payback = 25\ years$

- Estimate adoption rate

$$Adoption\ Rate = \frac{1 - e^{-(p+q)*t}}{1 + \left(\frac{q}{p}\right) * e^{-(p+q)*t}}$$

- Estimate PV penetration

$$PV\ Penetration = Maximum\ Market\ Share * Adoption\ Rate$$

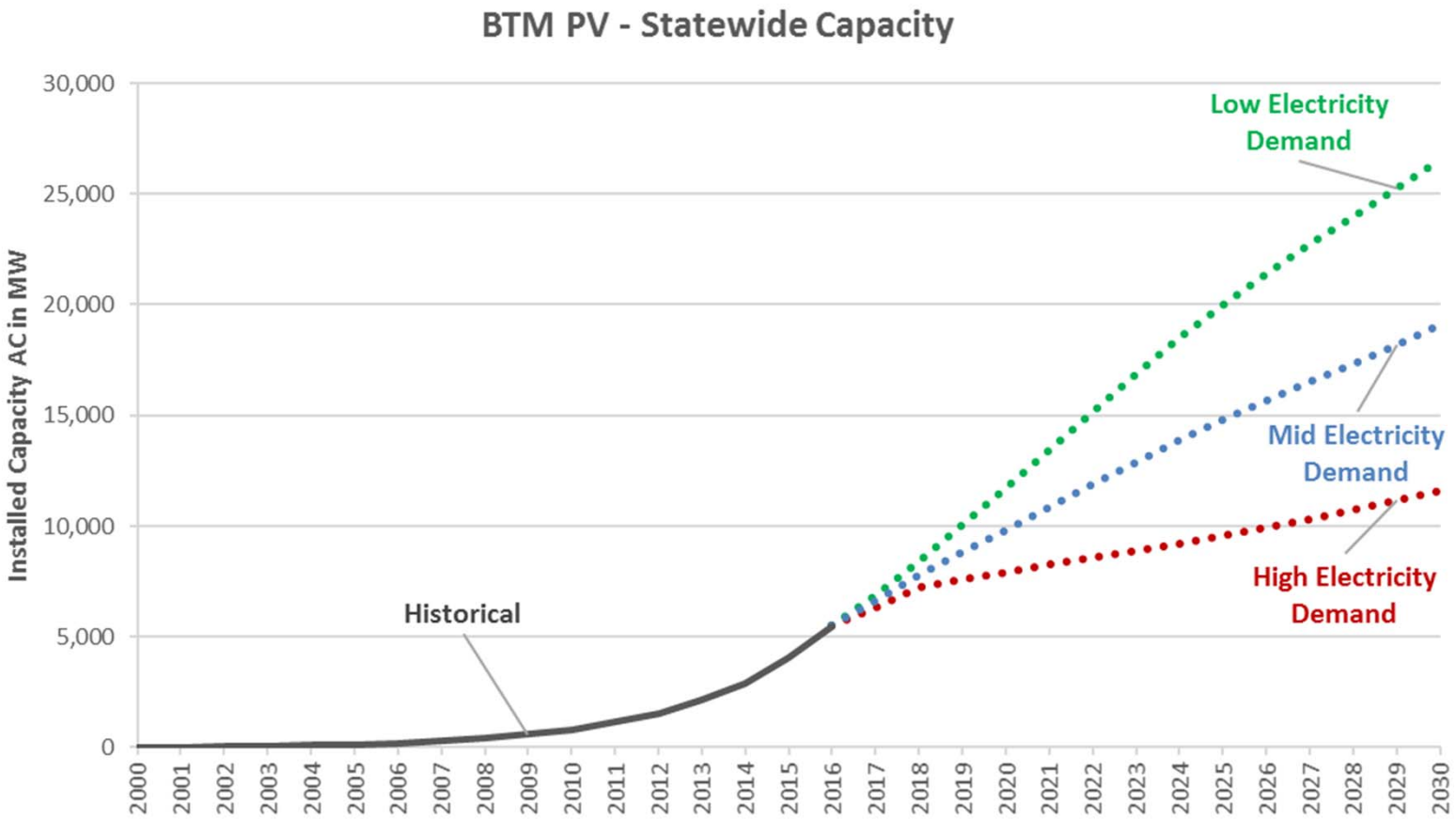
Forecasting PV Generation

- Installed capacity is used for estimating energy and peak impact

$$Energy_{fz} = PV\ Capacity_{fz} * Avg.Capacity\ Factor_{fz} * hours$$

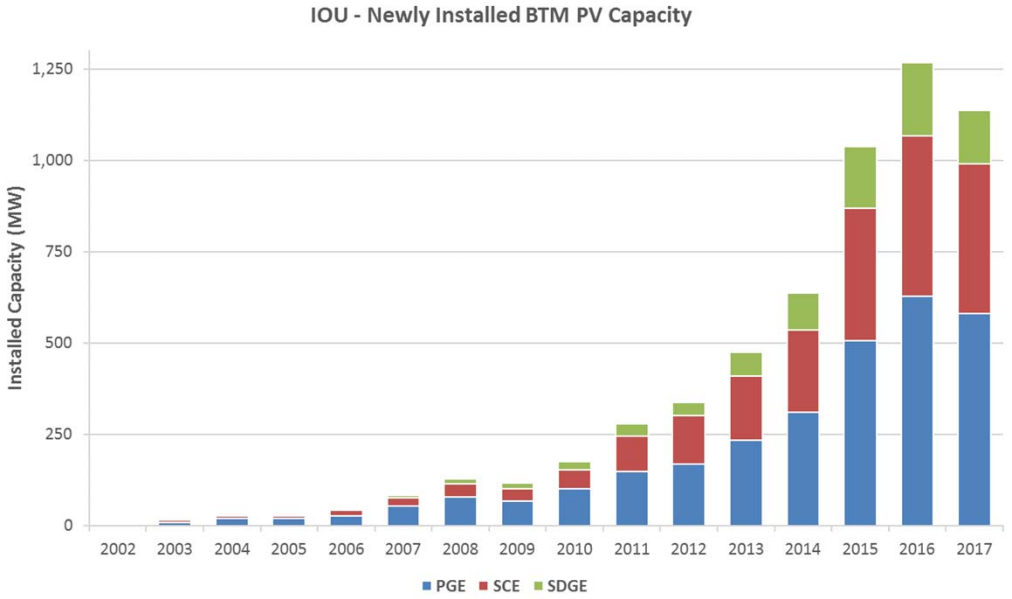
  - Energy is estimated at monthly intervals by carrying additions at a monthly level out to the last year of the forecast cycle.
  - PV output is degraded by .5% after every 12 months of operation.
  - The monthly data is then converted to hourly using PV shapes.

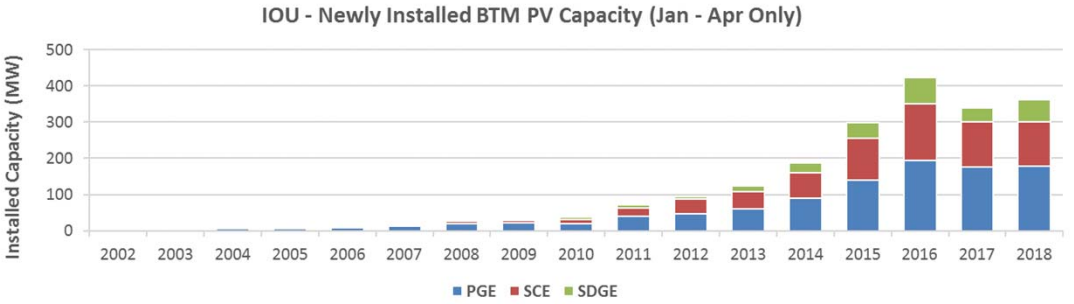
Review: 2017 BTM PV Forecast



Recent Trends – BTM PV Installations

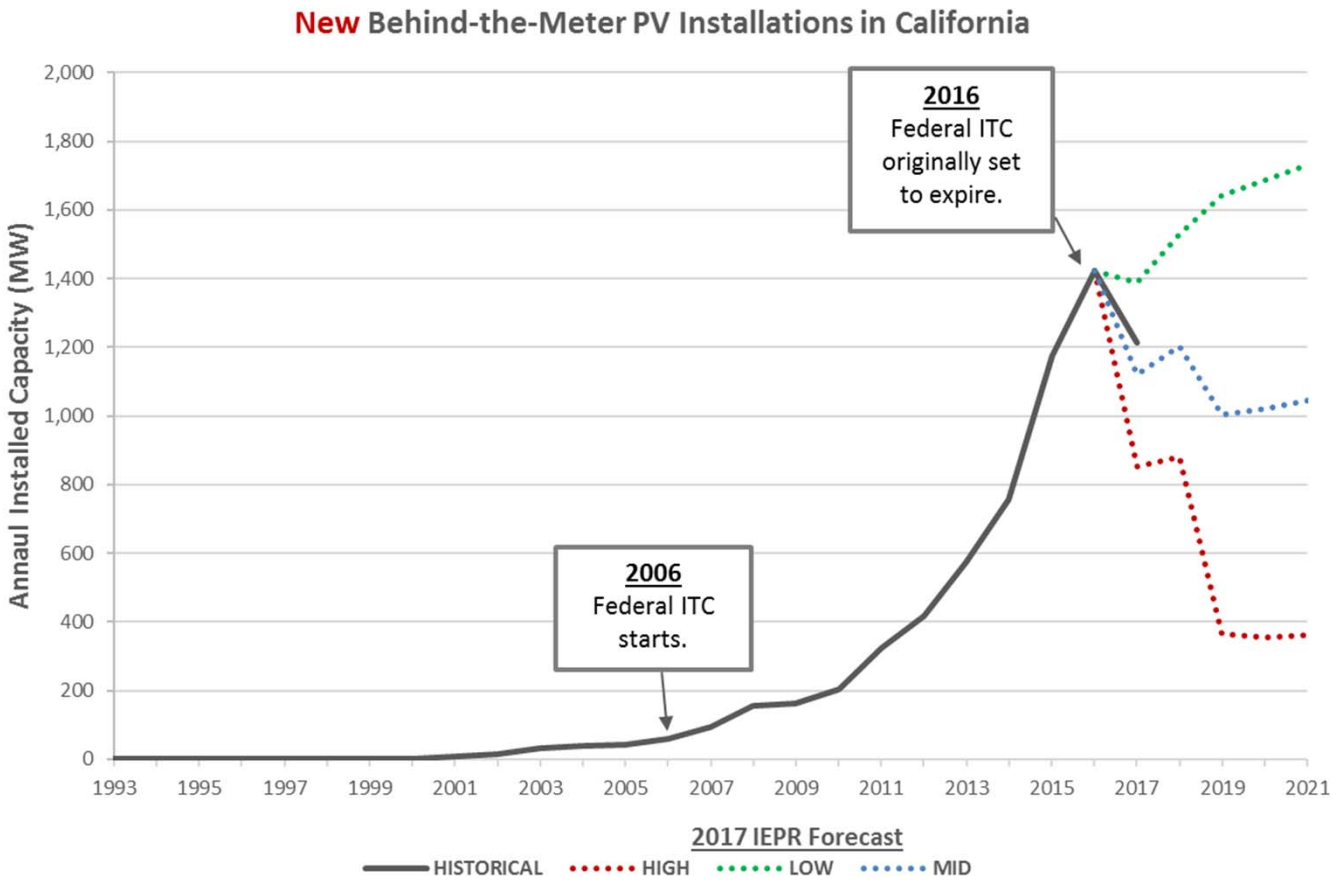
- 2017
  - New PV installations decreased by 10% from 2016 levels
    - Return to normal levels from a spike caused by an expected expiration of federal solar investment tax credit?
- 2018
  - Data for first four months
    - Slight growth in new installations from 2017





source: www.californiadgstats.ca.gov "NEM Currently Interconnected Data Set".

2017 PV Forecast vs. Measured Installations

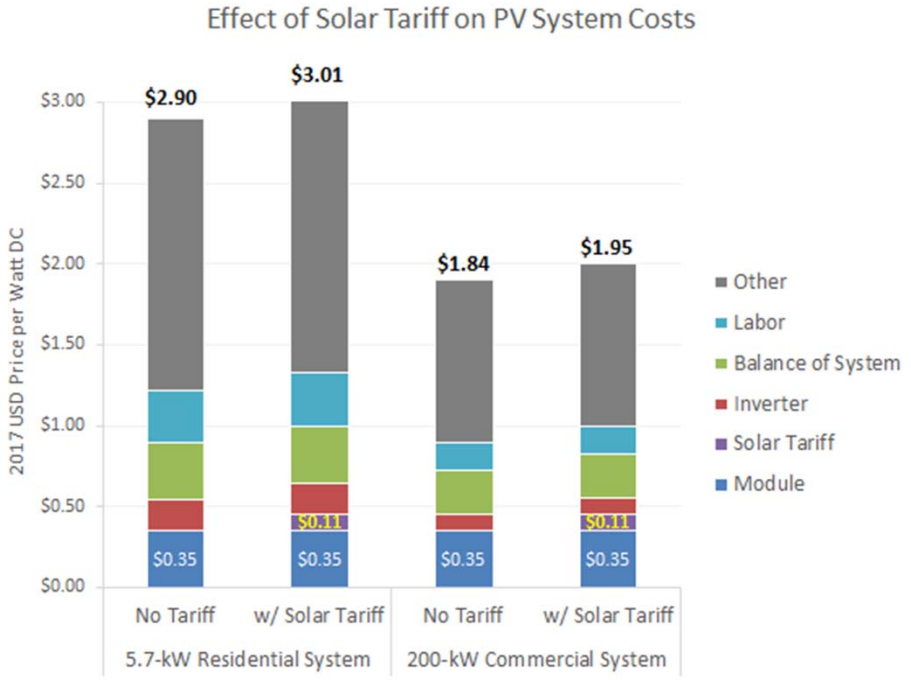


2018 BTM PV Forecast Update

- Update historical data
  - 2017 PV installation data
  - Econ / Demo
    - Housing count
  - Installation costs

- New tariff on imported PV modules
  - Tariff = 30% of module cost in 2018
    - 25% in 2019
    - 20% in 2020
    - 15% in 2021
    - Eliminated thereafter
  - Not expected to have major impact on residential or commercial installation costs

- 2019 Title 24 Building Standards



Source: Energy Commission analysis of National Renewable Energy Laboratory data.

AAPV Forecast Update

- Additional achievable photovoltaic (AAPV) adoption
  - Accounts for PV system requirements for new homes (2019 Title 24 standards)
  - In baseline forecast, a certain percentage of new homes adopt PV systems
  - AAPV = difference between PV adoptions for new homes due to 2019 Title 24 regulations vs. new home PV adoptions already in baseline forecast
- Future of AAPV forecast
  - For 2018 IEPR update, AAPV remains separate from baseline forecast
    - Maintain consistency with AAEE forecast
  - AAPV will be incorporated into 2019 baseline PV forecast
- Revisit / update assumptions from 2017 IEPR AAPV
  - Expected level of compliance
  - Average PV system size for new homes