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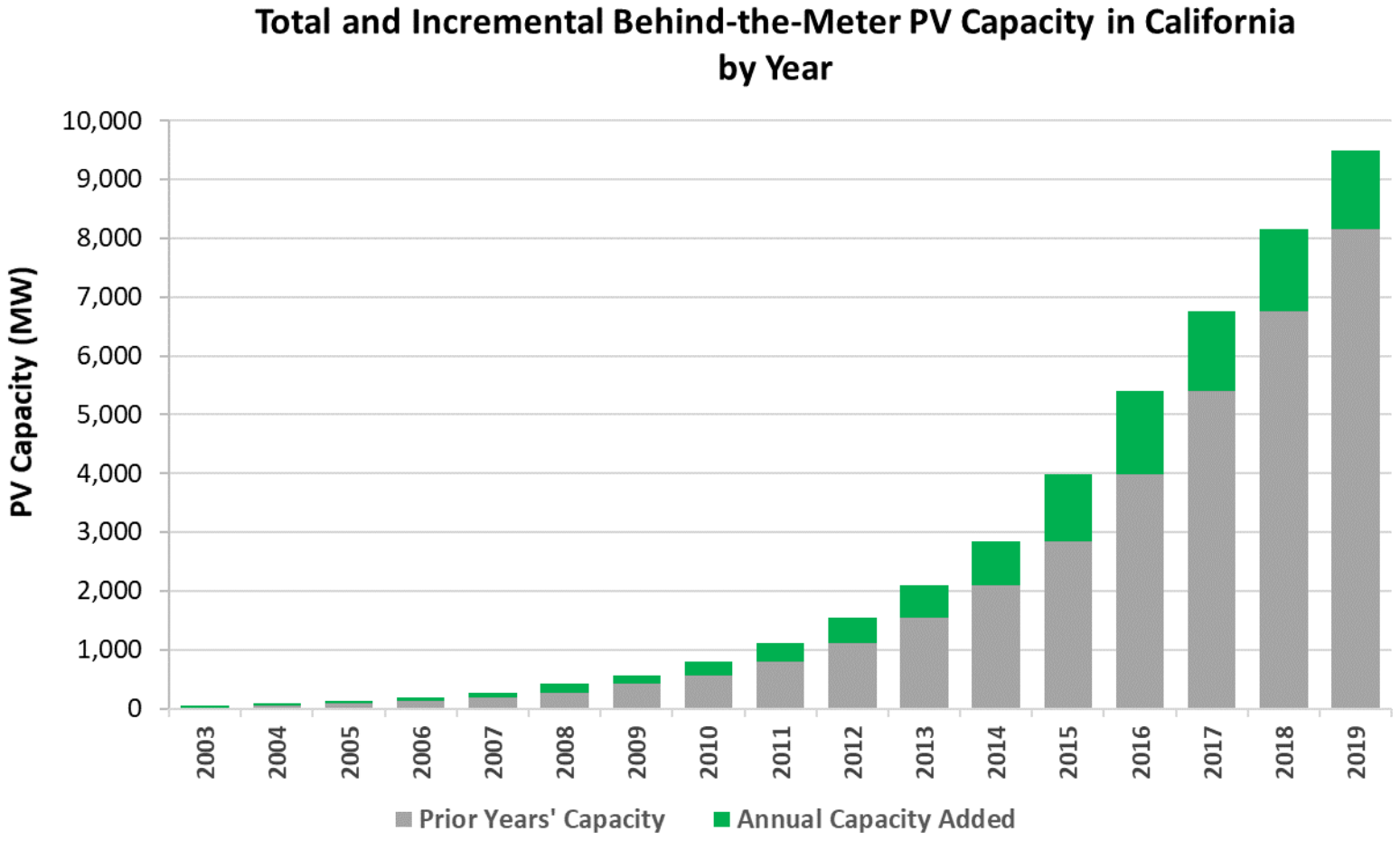
Overview

- Presentation will cover four topics
  - Review historical behind-the-meter (BTM) PV installation data
  - Review forecast inputs and scenarios
  - Present CEDU 2020 BTM PV forecast results
  - BTM energy storage methodology and results

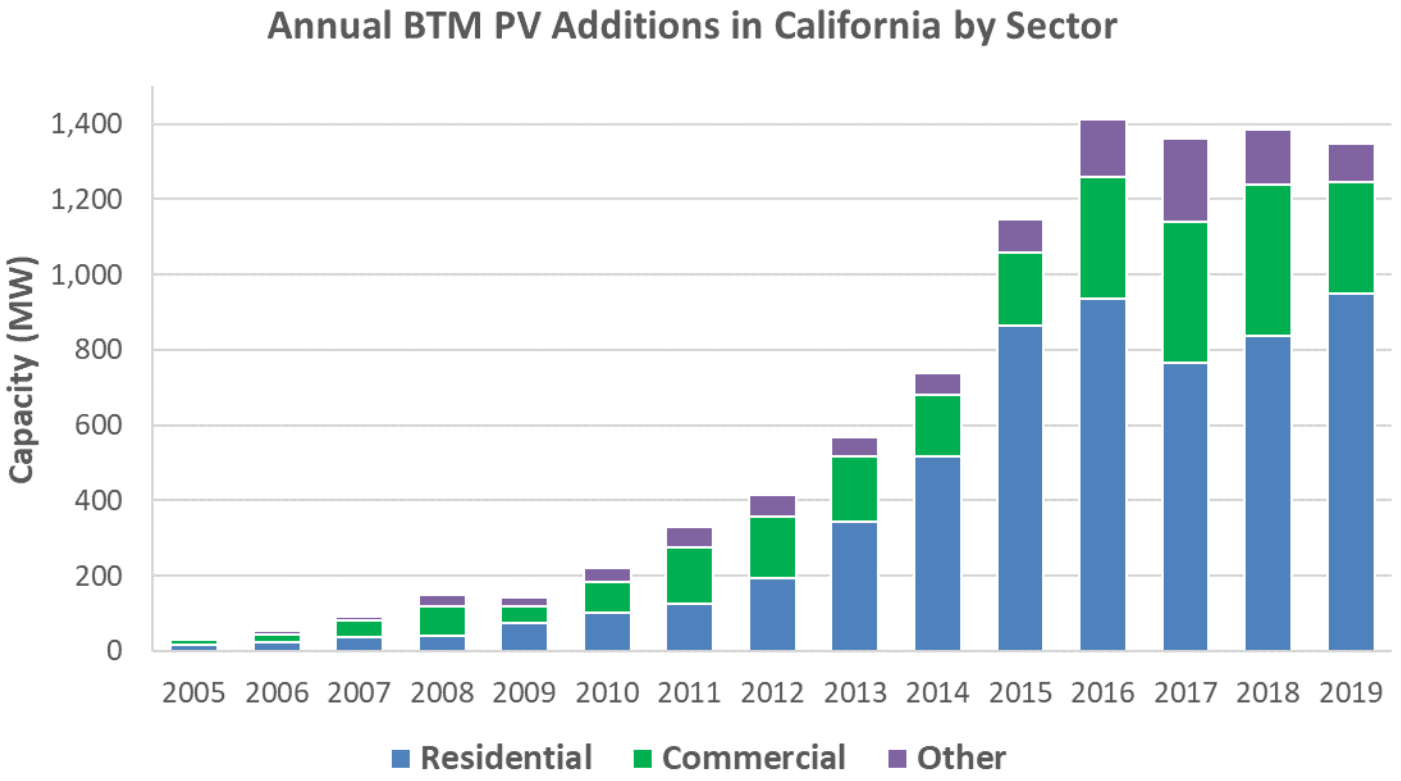
- Important changes to 2020 BTM PV Forecast
  - Revisions to historical PV installation data
  - Improved PV system classification (to better align with CEC sectors)
  - Revised PV capacity factors – incorporating PV tilt and orientation data.
  - Refer to August 28th, IEPR workshop for more details on these changes
    - https://efiling.energy.ca.gov/GetDocument.aspx?tn=234487&DocumentContentId=67313

BTM PV Capacity Additions



- Statewide BTM PV Capacity at the end of 2019: > 9,400 MW

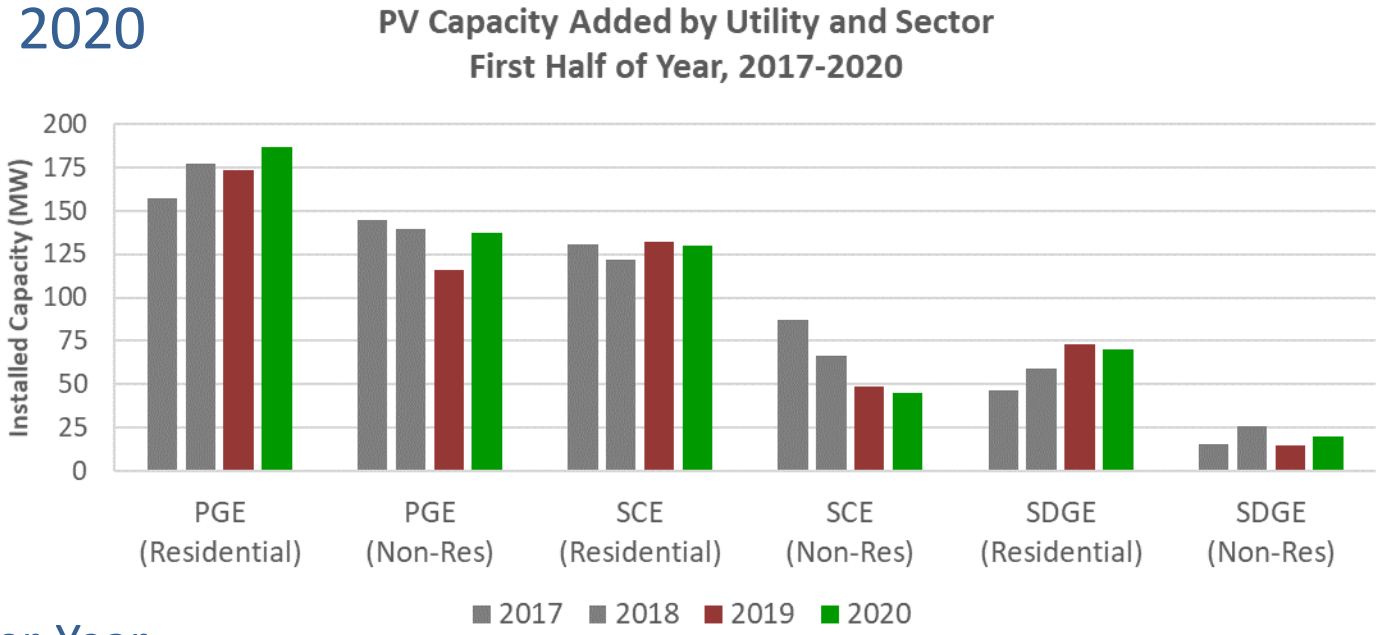
PV Capacity Additions by Sector



- Maturing PV market: about 1,300-1,400 MW installed annually 2016-19

2020 PV Installations Similar to 2019

- New factors affecting solar adoption
  - Drop in the federal ITC (from 30% to 26%)
  - Title 24 PV requirements are now in full effect
  - Pandemic (and the associated economic downturn)?
- IOU Data through June 30, 2020



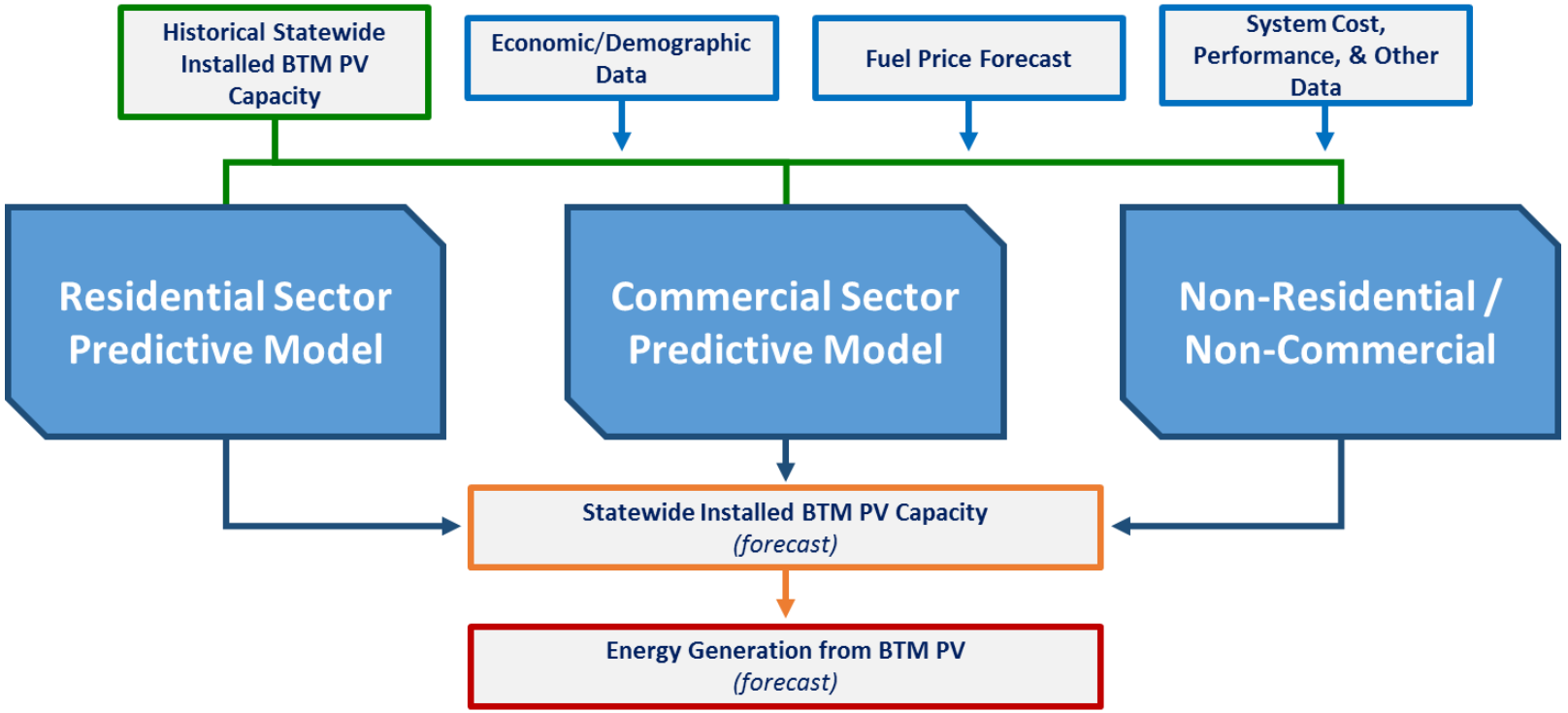
Source: California Energy Commission analysis of NEM Interconnection Applications data sets.

  - Installations similar Year-over-Year
  - Not enough data to discern underlying trends in BTM PV market

BTM PV Forecast

Inputs and Statewide Results

Energy Commission PV Model



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

Updates to PV Forecast Inputs

- Demographic / economic data
  - Household growth
    - Slower compared to 2019 forecast
  - Commercial floorspace
    - Slightly lower growth compared to 2019 forecast
  - GSP Deflator

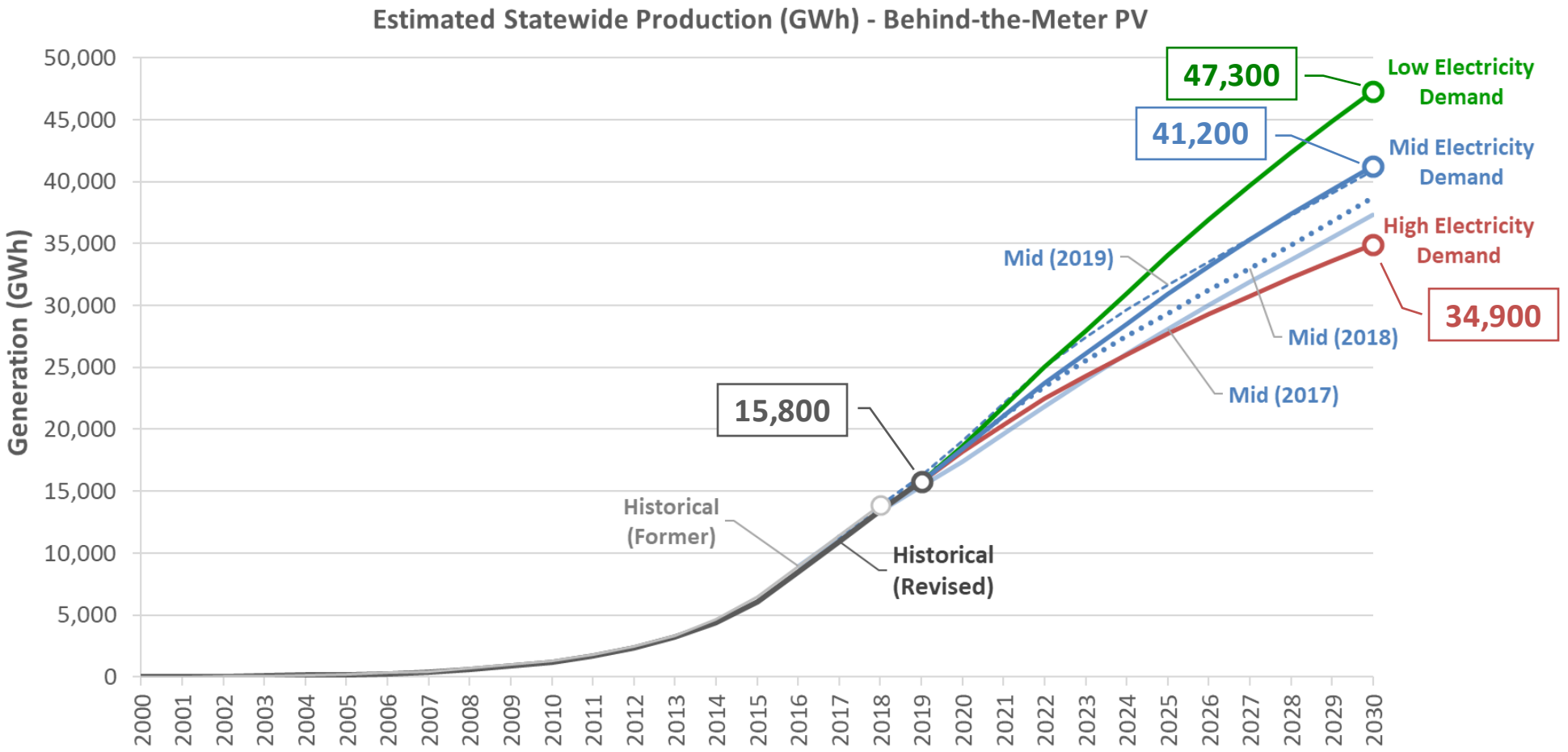
- Forecast of Electricity rates
  - Similar to 2019 forecast

- Included new commercial sector TOU tariffs
  - PG&E: B-1, B-6, B-10, B-19, B-20
  - SMUD: Restructuring of commercial TOU rates

Scenario Definitions

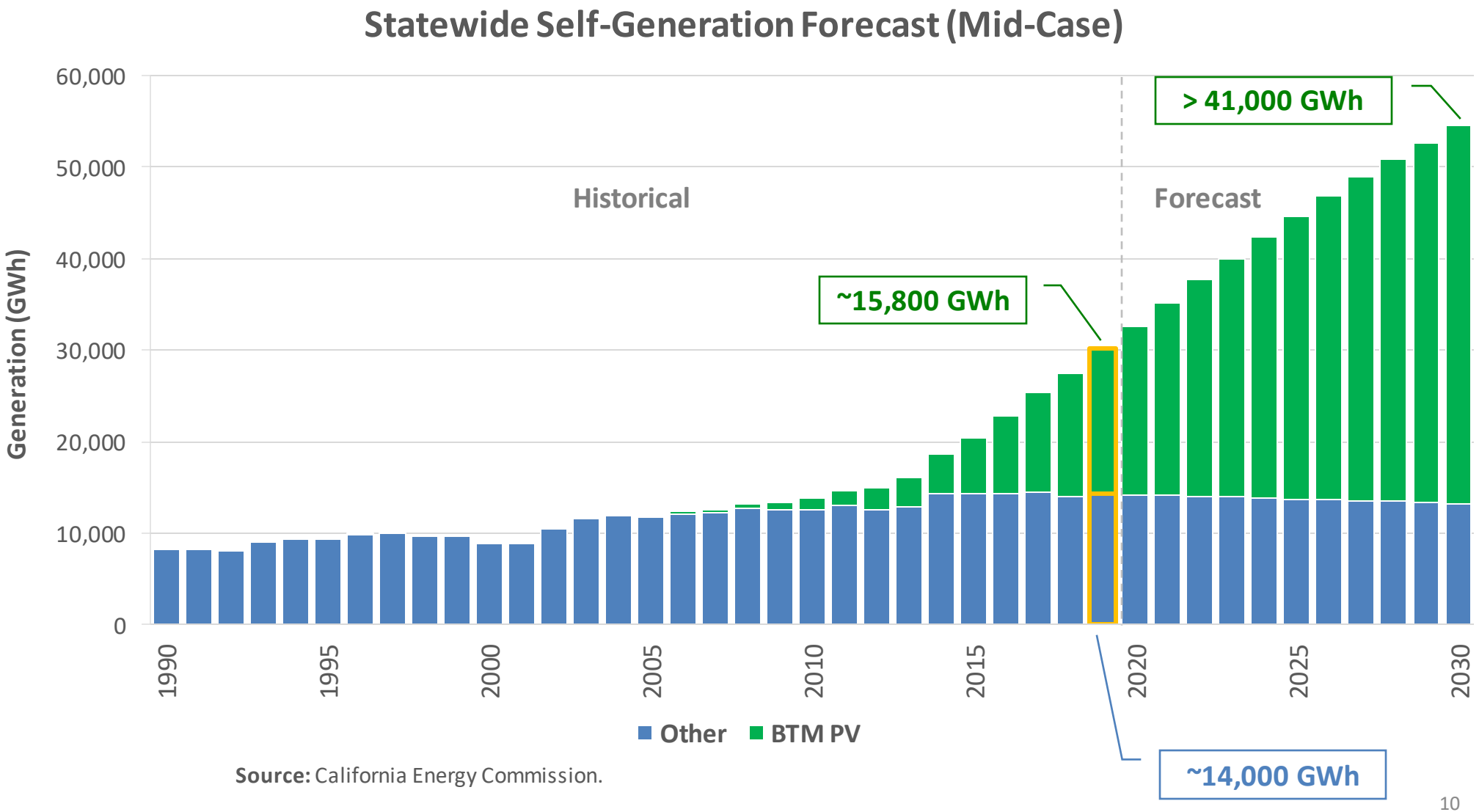
- High = High Electricity Demand Case
  - High economic / demographic growth → high growth in building stock
  - Low electricity rates
  - Low PV adoption
- Low = Low Electricity Demand Case
  - Low economic / demographic growth → low growth in building stock
  - High electricity rates
  - High PV adoption
- Mid = Mid Electricity Demand Case

2020 Statewide BTM PV Forecast



Source: California Energy Commission.
Note: For consistency, 2017 and 2018 forecasts include AAPV forecast results.

Self-Generation Forecast

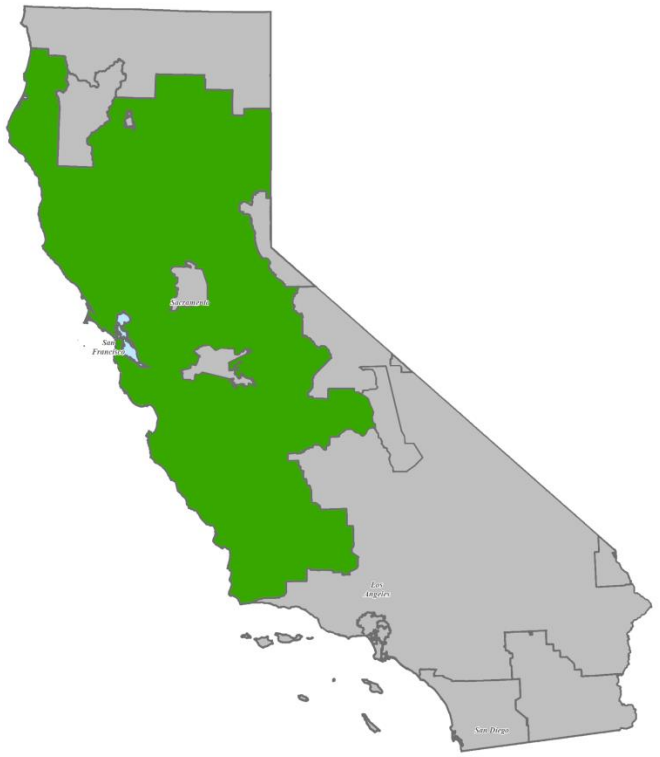


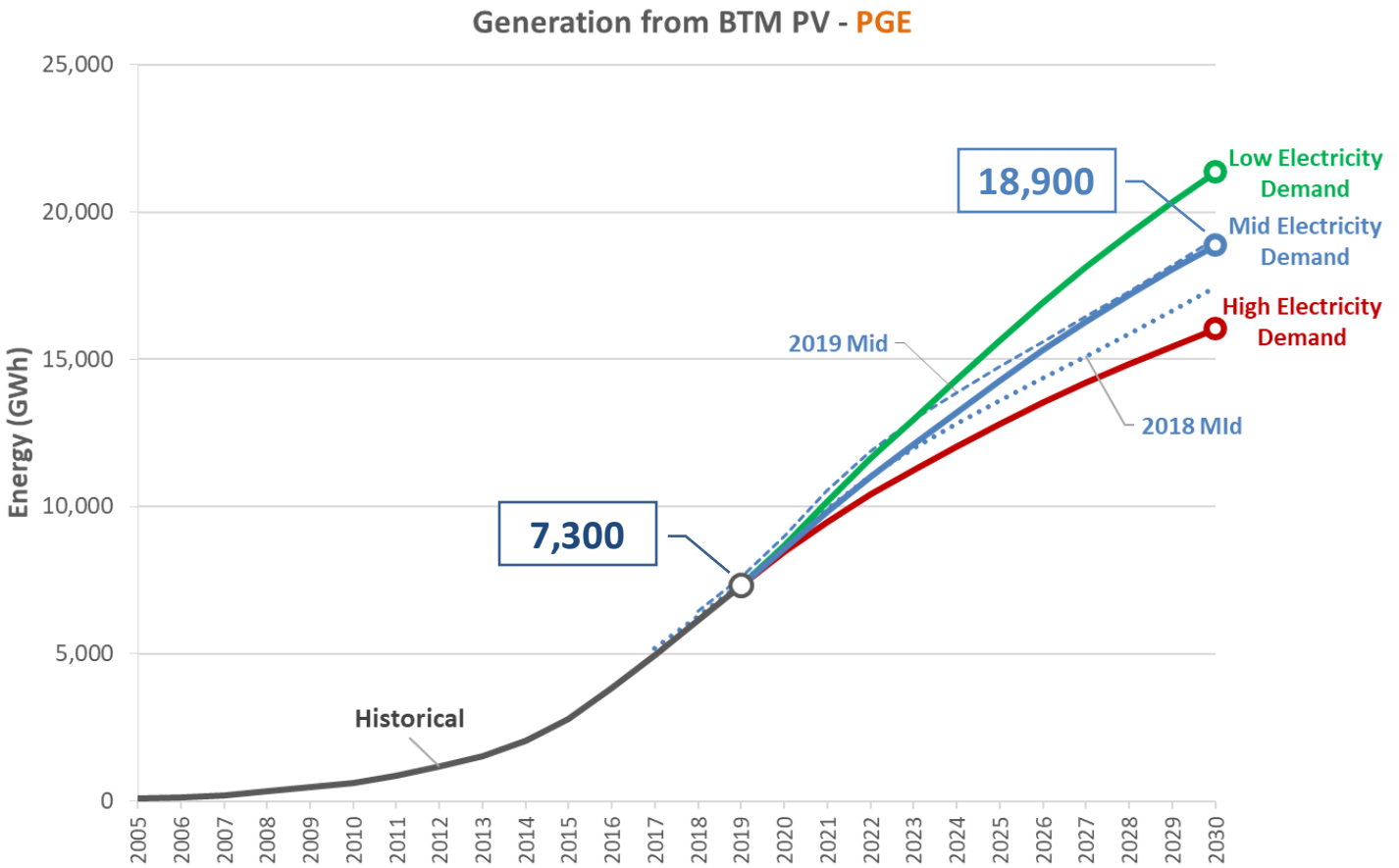
Source: California Energy Commission.

Utility / Planning Area Forecasts

PG&E PV Forecast

- PV Generation forecast to grow to ~19,000 GWh by 2030 in mid-case

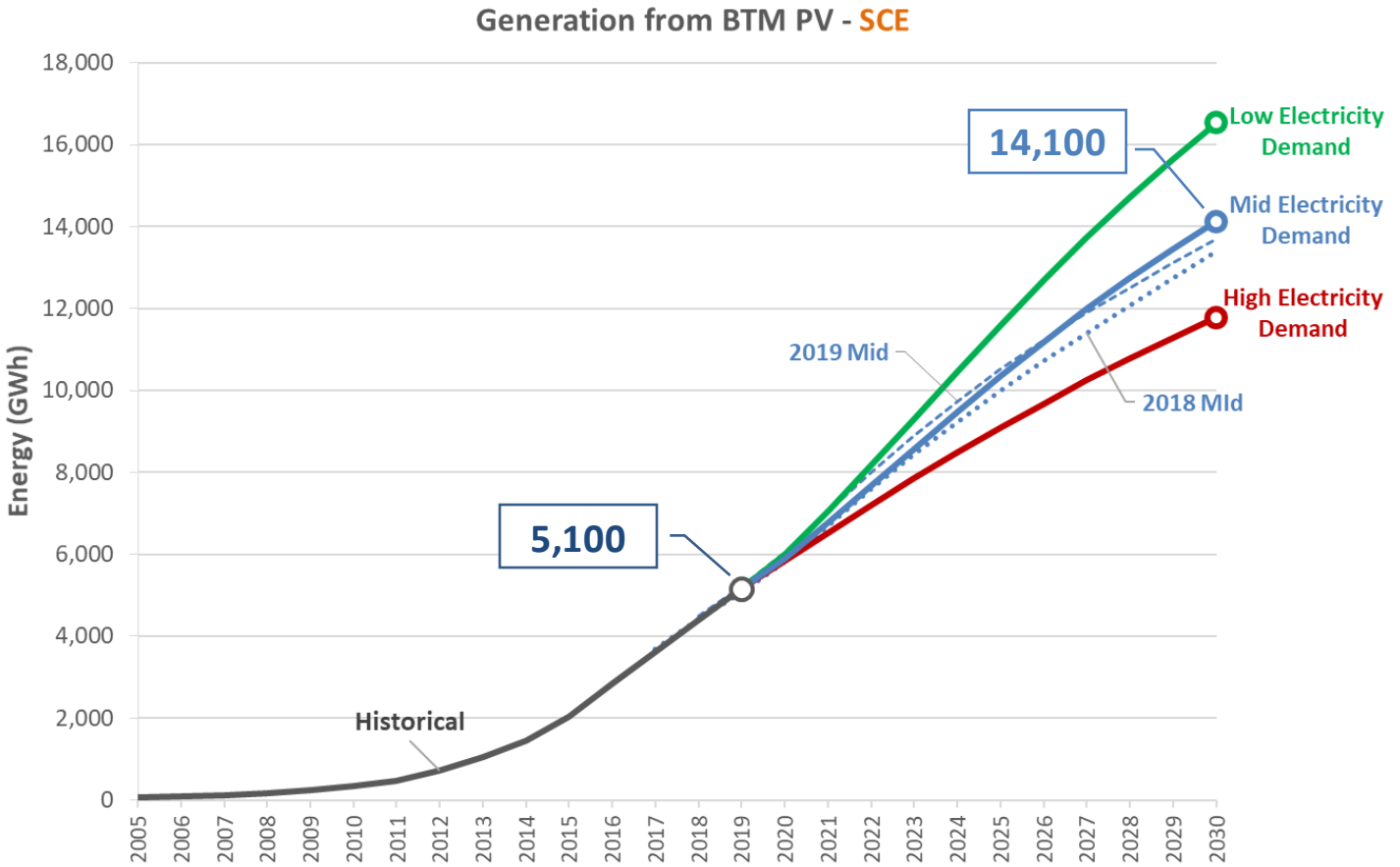




NOTE: 2018 forecast includes AAPV forecast results.

SCE PV Forecast

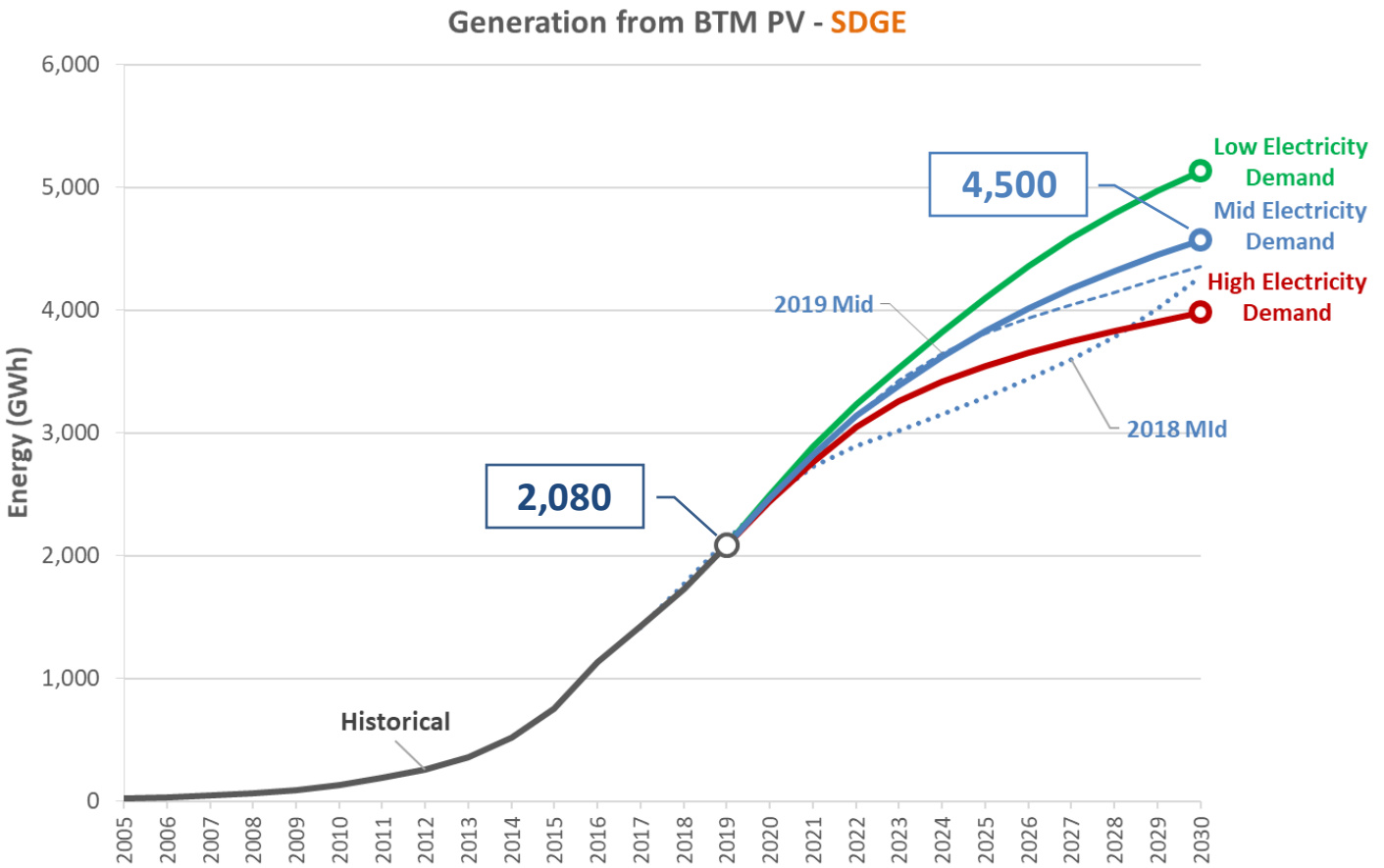
- PV Generation forecast to grow to 14,100 GWh by 2030 in mid-case



NOTE: 2018 forecast includes AAPV forecast results.

SDG&E PV Forecast

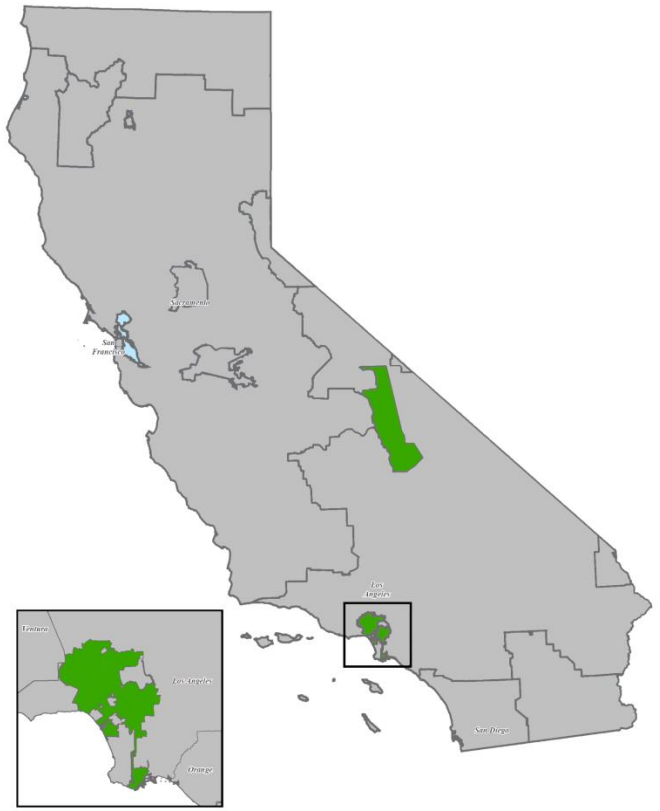
- PV Generation forecast to increase to 4,500 GWh by 2030 in mid-case

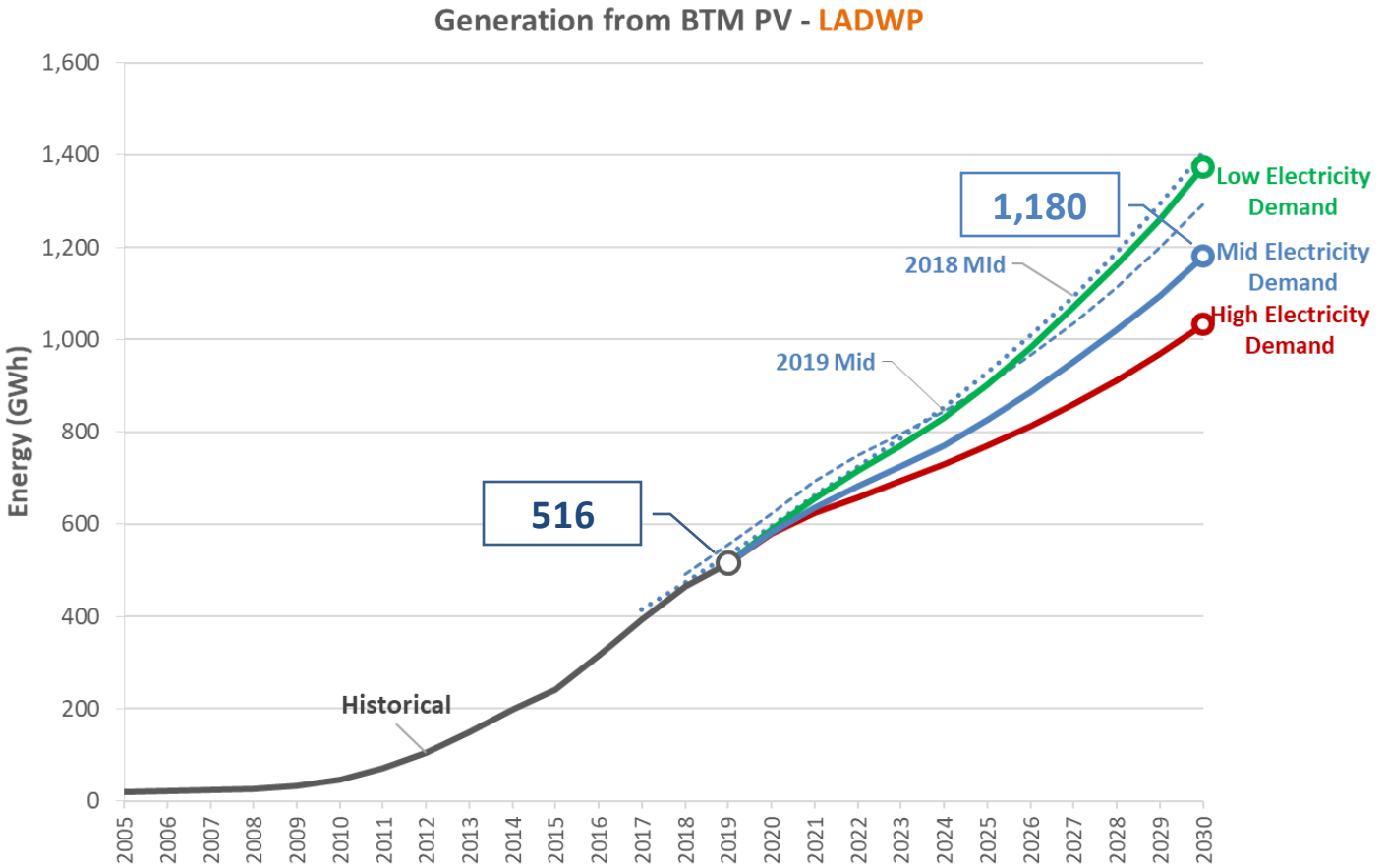


NOTE: 2018 forecast includes AAPV forecast results.

LADWP PV Forecast

- PV Generation forecast to grow to ~1,200 GWh by 2030 in mid-case

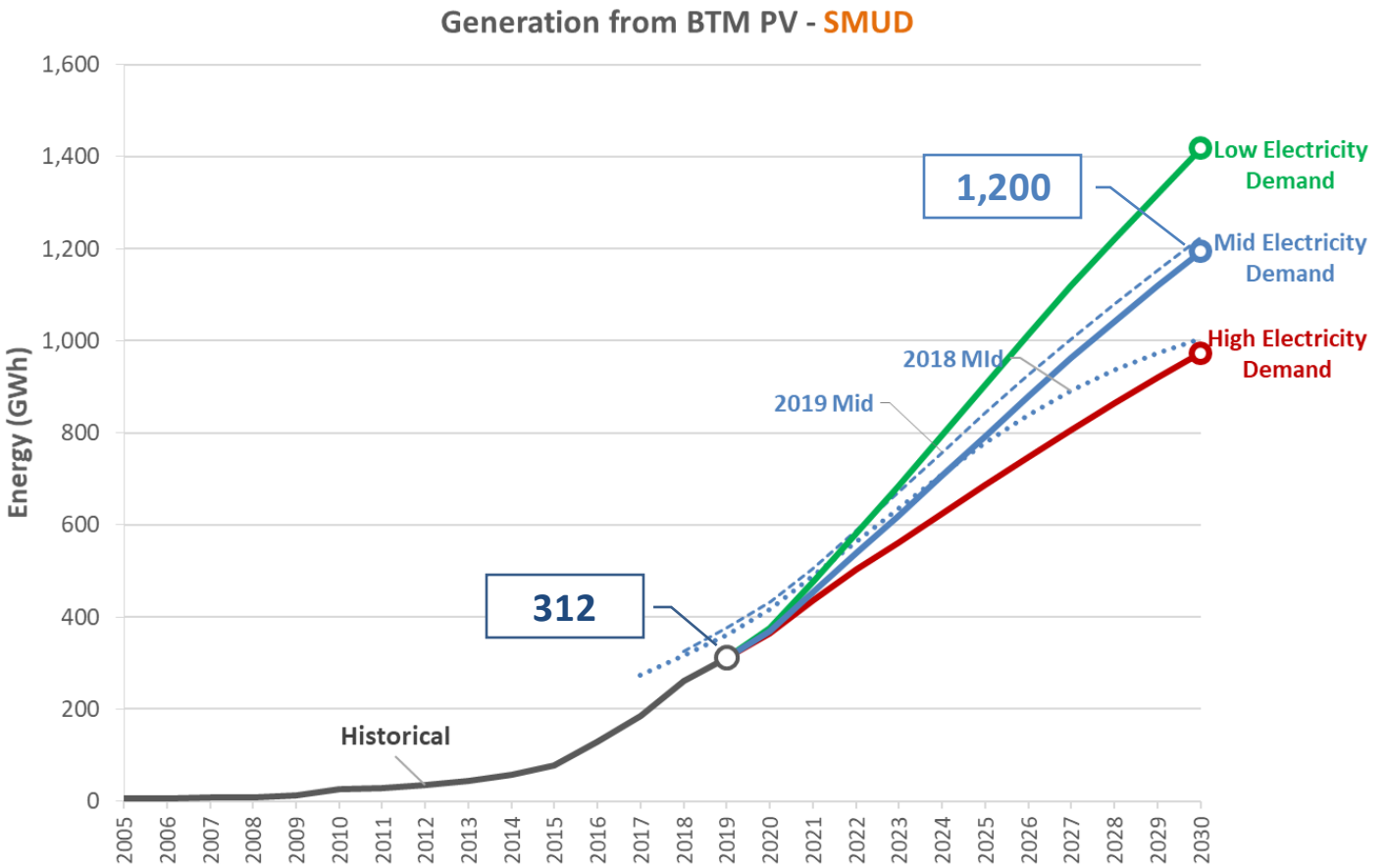




NOTE: 2018 forecast includes AAPV forecast results.

SMUD PV Forecast

- PV Generation forecast to grow to 1,200 GWh by 2030 in mid-case



NOTE: 2018 forecast includes AAPV forecast results.

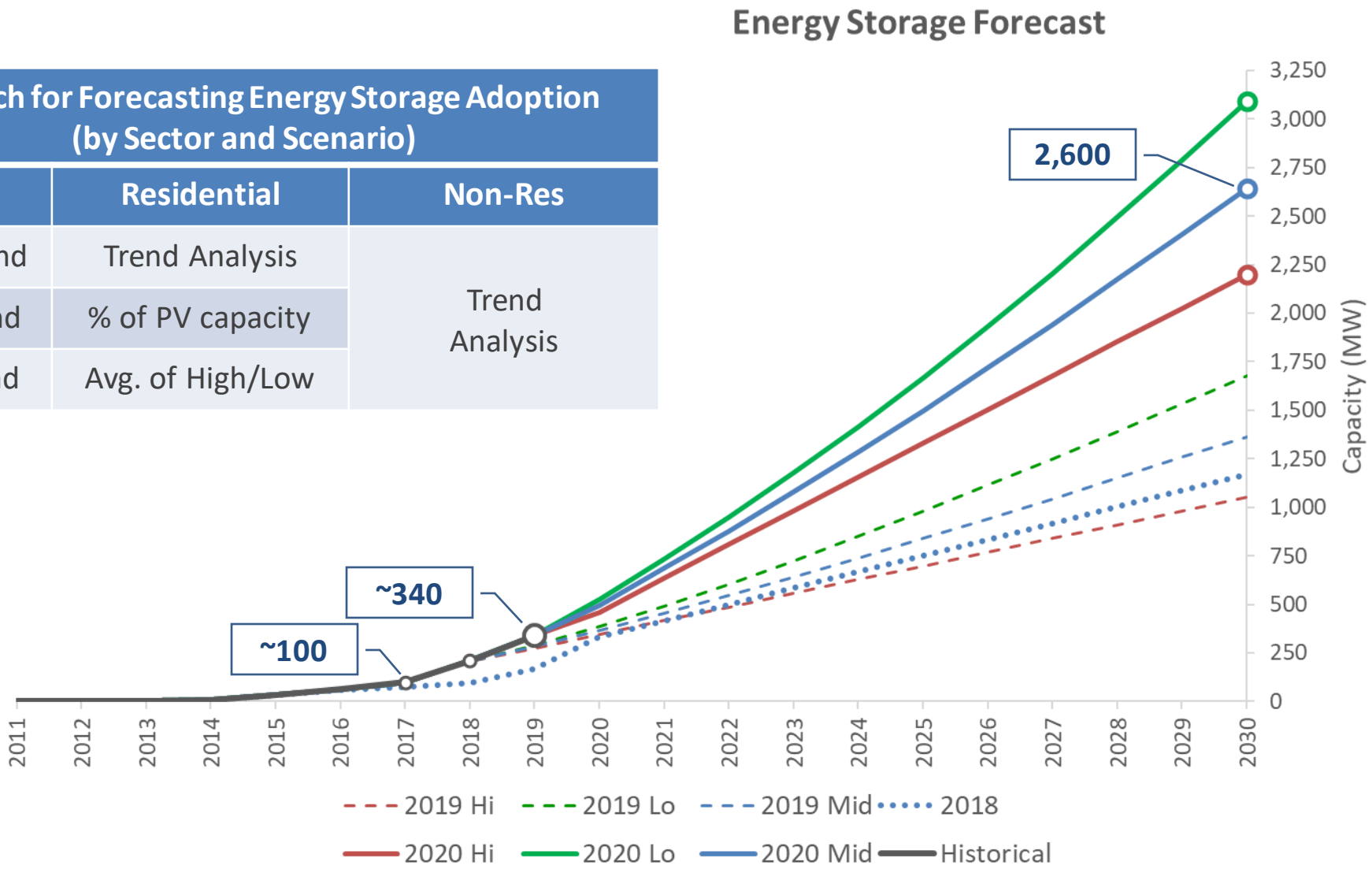
BTM Energy Storage Forecast

BTM Energy Storage Adoption

- No methodological changes since 2019 in forecasting BTM storage adoption
- Incorporated latest Rule 21 and SGIP storage installation data
- Storage adoption in 2019 was higher than forecast.
  - Forecast adoption for 2019:
    - Low Demand: ~ 70 MW
    - High Demand: ~ 78 MW
    - Mid Demand: ~ 85 MW
  - Actual 2019: ~ 130 MW
- SGIP program shows significantly higher number of applications since a year ago.
  - 473 MW of outstanding reservations for funding as of 11/02/2020
  - 73 MW of outstanding reservations for funding as of 10/21/2019

Storage Forecast Results

Approach for Forecasting Energy Storage Adoption (by Sector and Scenario)		
Scenario	**Residential**	**Non-Res**
High Demand	Trend Analysis	Trend Analysis
Low Demand	% of PV capacity	
Mid Demand	Avg. of High/Low	



Storage Forecast by Planning Area

- Table shows the forecast of BTM energy storage capacity for PG&E, SCE, and SDG&E by demand case.
- Methodology for forecasting storage capacity is unchanged from last year's forecast.
- Adoption for POUs is low compared to IOUs, but storage data for POUs is also incomplete.

BTM Storage Installed Capacity (MW)					
	YEAR	PG&E	SCE	SDG&E	OTHER
HIGH	2019	111	158	66	5
	2020	161	207	81	9
	2022	317	341	132	18
	2025	551	543	208	28
	2030	942	879	334	44
MID	2019	111	158	66	5
	2020	182	217	85	9
	2022	351	364	143	20
	2025	625	602	238	33
	2030	1,130	1,043	411	59
LOW	2019	111	158	66	5
	2020	202	227	89	10
	2022	384	387	155	22
	2025	698	662	268	38
	2030	1,318	1,207	489	75

Deployment of BTM Storage

- Non-residential storage systems
  - Updated charge / discharge profiles from the 2018 SGIP Storage Impact Evaluation report (released Jan 2020)
    - Available at: www.cpuc.ca.gov/General.aspx?id=7890
  - The 2019 forecast used the 2017 SGIP Storage Impact Evaluation report

- Residential storage systems
  - Subject to new SGIP eligible requirements
    - "all new residential IOU and non-IOU customers are required to enroll in a time-varying rate with a peak period starting at 4 pm or later and with a summer peak to off-peak price differential of 1.69 or more, if such rate is available"
      - Available at: www.selfgenca.com/documents/handbook/2020

SGIP Approved TOU Rates

- For the PG&E, SCE, and SDG&E rate tariffs used to model storage deployment in CED 2019 would be ineligible for new SGIP funding.
- For new residential applications, table below shows SGIP approved tariffs.

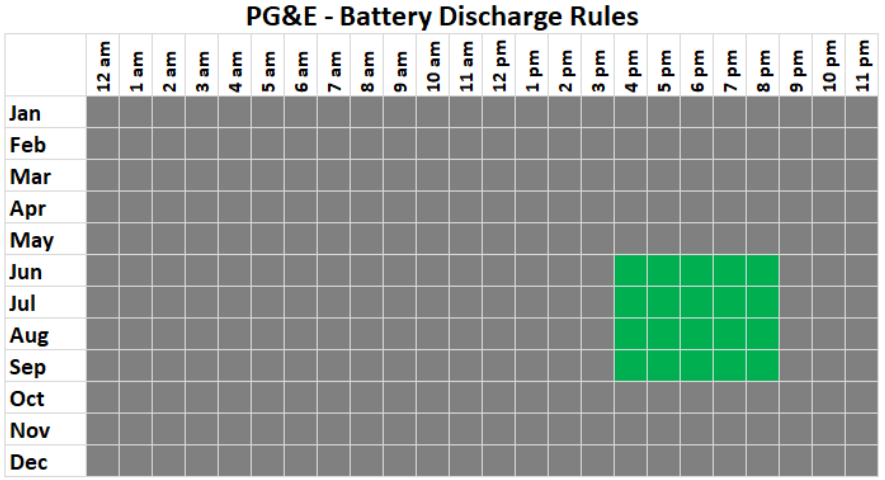
		PG&E	SCE	SDG&E	SMUD
	CED 2019	**E-TOU-C**	**TOU-D-4-9**	**Residential TOU DR-2**	**Time of Day (5-8 p.m.)**
Approved by SGIP	Option 1	EV-A	Residential TOU-D-Prime	Residential TOU DR-1	Time of Day (5-8 p.m.)
	Option 2	EV-B	TOU-EV-1 Residential	EV-TOU	-
	Option 3	EV2-A	TOU-D-5-8	EV-TOU-2-Residential	-
	Option 4	-	-	EV-TOU-4	-

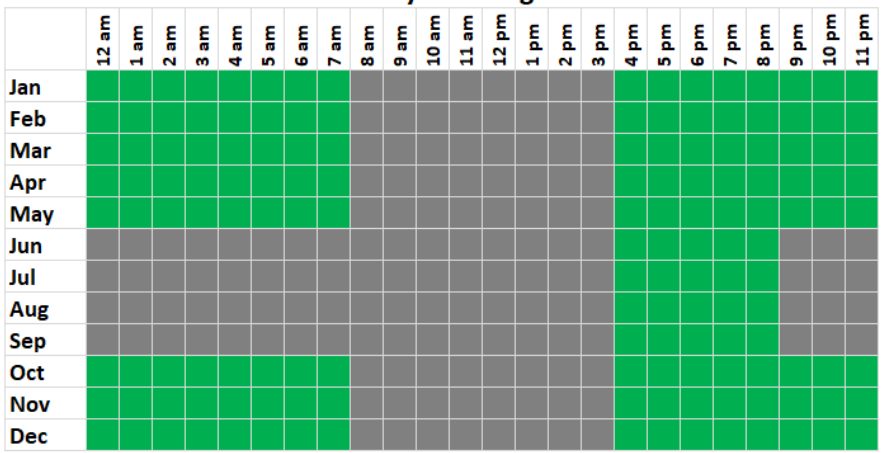
Source: California Energy Commission, Self-Generation Incentive Program (www.selfgenca.com/home/resources/)

- SDG&E: option 1 has similar TOU periods as tariff modeled in 2019…will keep residential charge / discharge profiles from 2019 forecast.
- PG&E and SCE: options have different TOU periods from tariffs modeled in 2019 → requires new residential charge / discharge profiles.

New Storage Profiles for PG&E and SCE

CED 2019 charge / discharge profiles

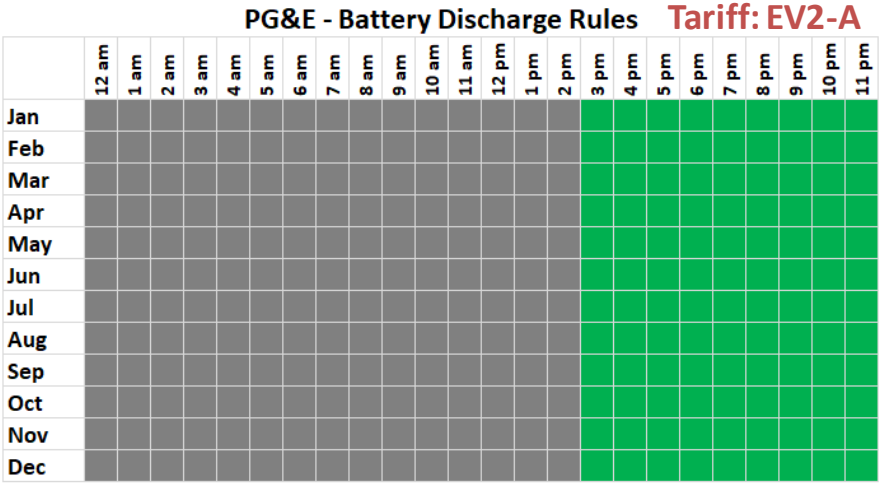


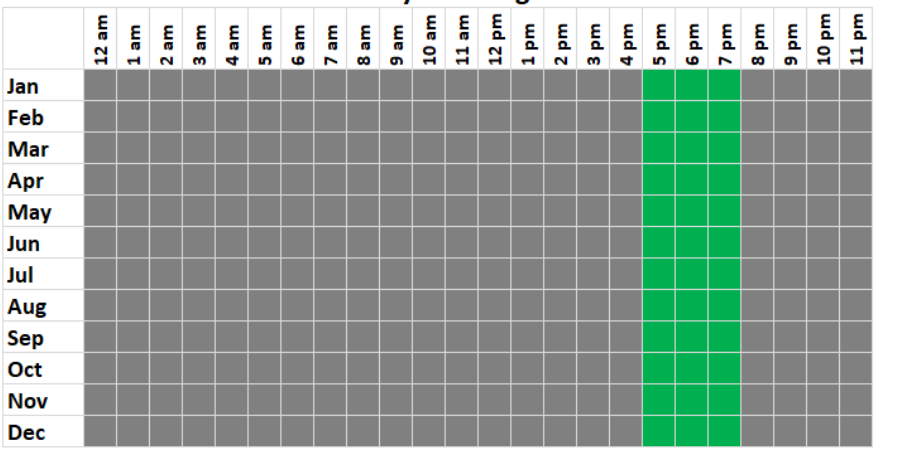


Discharge Allowed

Discharge Not Allowed

New charge / discharge profiles





Note: Battery can only charge using a PV system