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California Energy Commission

Distributed Generation Forecast Updates

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August 18, 2023

Historical Behind-The-Meter Distributed Generation Updates

Historical BTM DG Updates

- Refreshed historical BTM solar PV and storage cumulative capacity estimates.
- Refinements include:
  - Shifting to a single data source for BTM solar PV and energy storage capacity information.
  - Improving and expanding data cleaning tools

Data Source Refinement

- Previously, CEC staff relied on three data sets to estimate historical cumulative BTM solar and energy storage capacity.
  - Historical cumulative BTM energy storage capacity was estimated from a combination of CPUC's Self Generation Incentive Program (SGIP) and Rule 21 interconnection data.
- This year, staff transitioned to utility distribution company (UDC) interconnection data collected under the California Code of Regulations to estimate historical cumulative DG capacity.
  - The data includes a list of all interconnected energy systems located within each UDC's service territory.

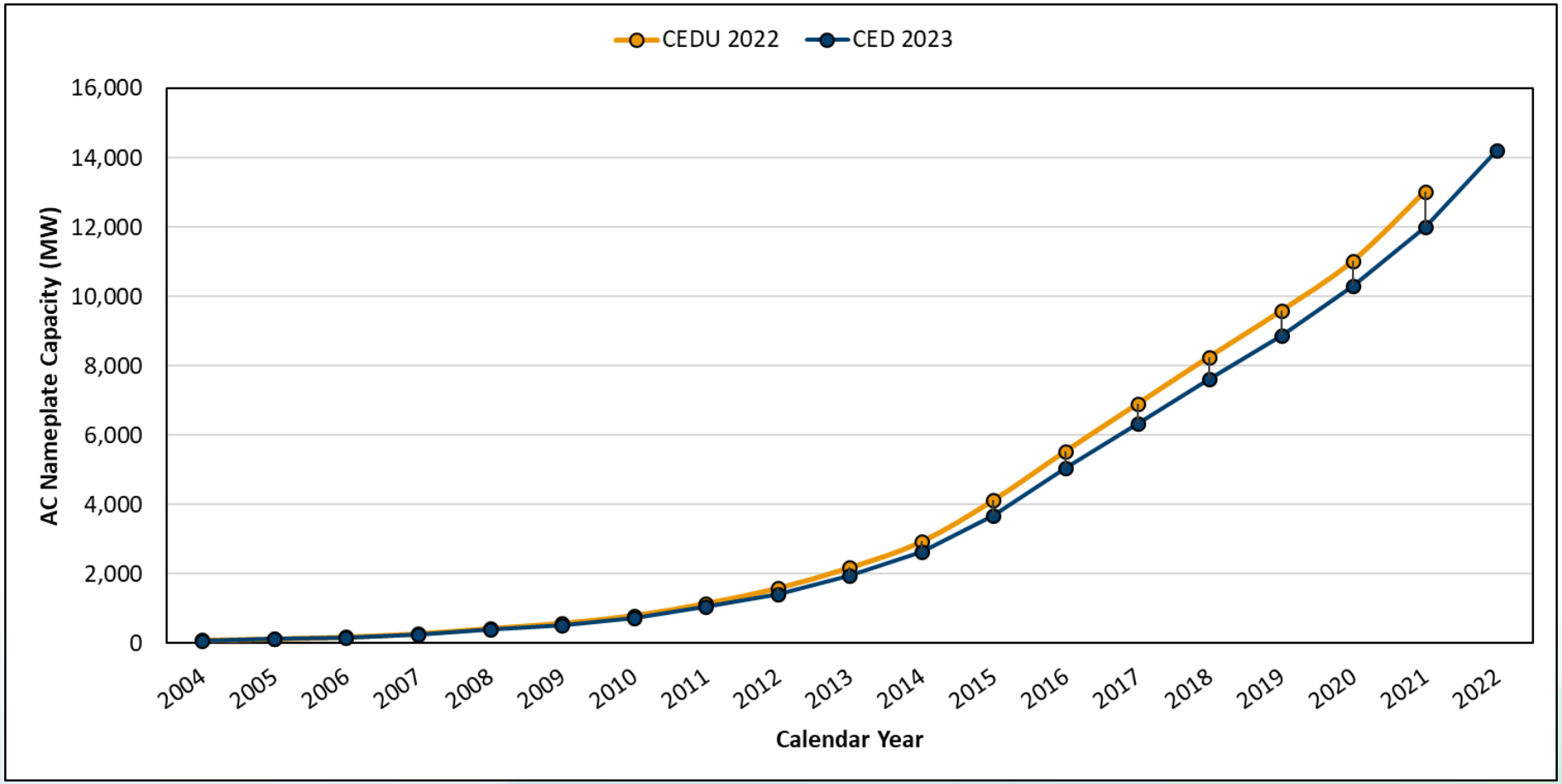
Data Cleaning Improvements

- Individual UDC interconnection data sets may contain unique formatting or data entry errors that must be addressed to estimate historical DG capacity.
  - Previously, staff manually cleaned UDC interconnection data to resolve data issues.
  - For the 2023 California Energy Demand (CED) Forecast, staff developed data cleaning scripts to improve the accuracy of our estimates.
    - The following slides highlight how our revised historical data cleaning process has impacted our historical BTM DG cumulative capacity estimates.

Historical BTM Solar Adoption

Historical BTM Solar Adoption: Statewide

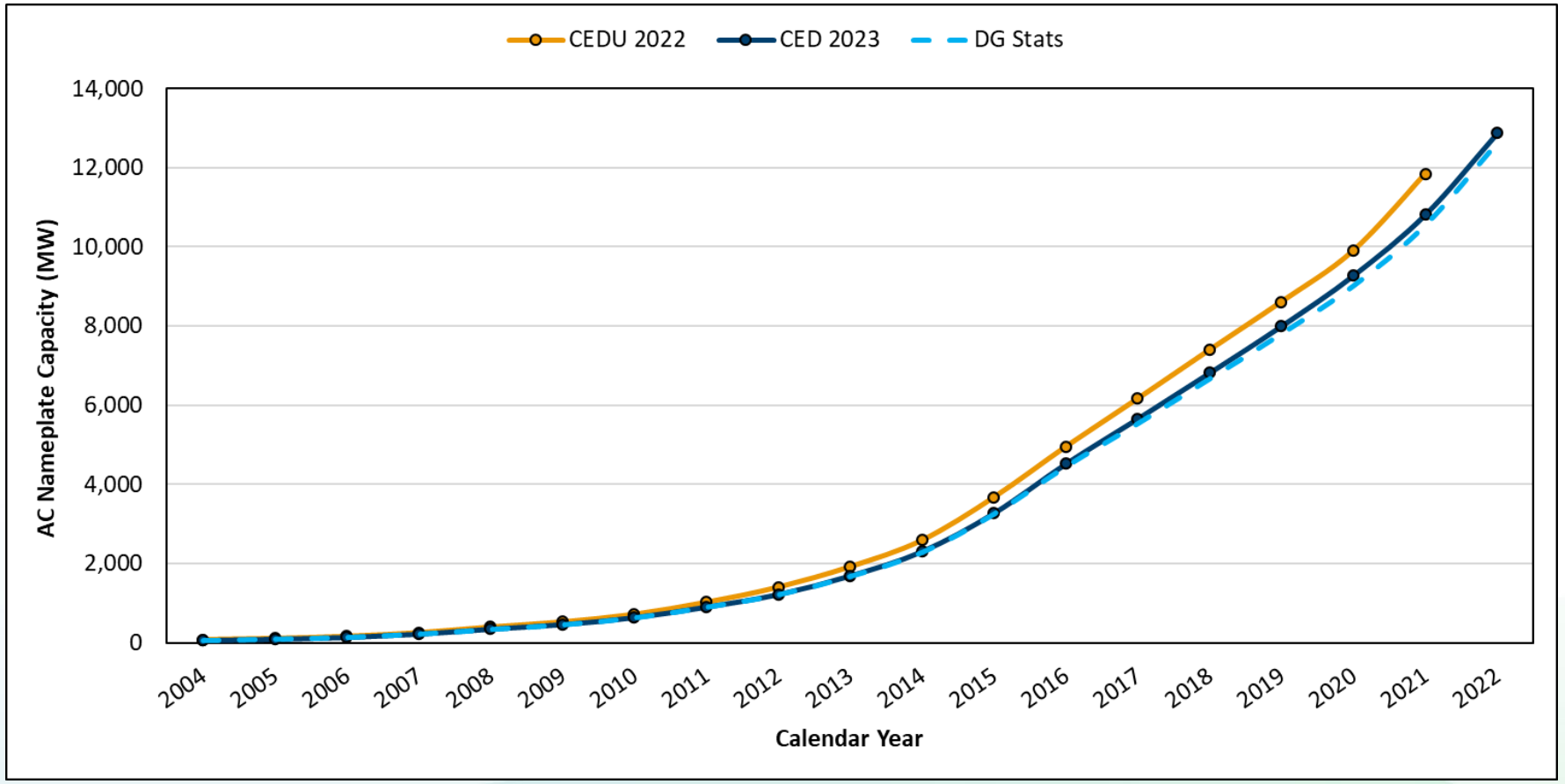
- CED 2023 estimates 14,220 MW of BTM solar capacity statewide by end of year 2022.
- Cumulative BTM solar capacity estimate is about 7% lower than CEDU 2022 in 2021.



Historical BTM Solar Adoption: CAISO

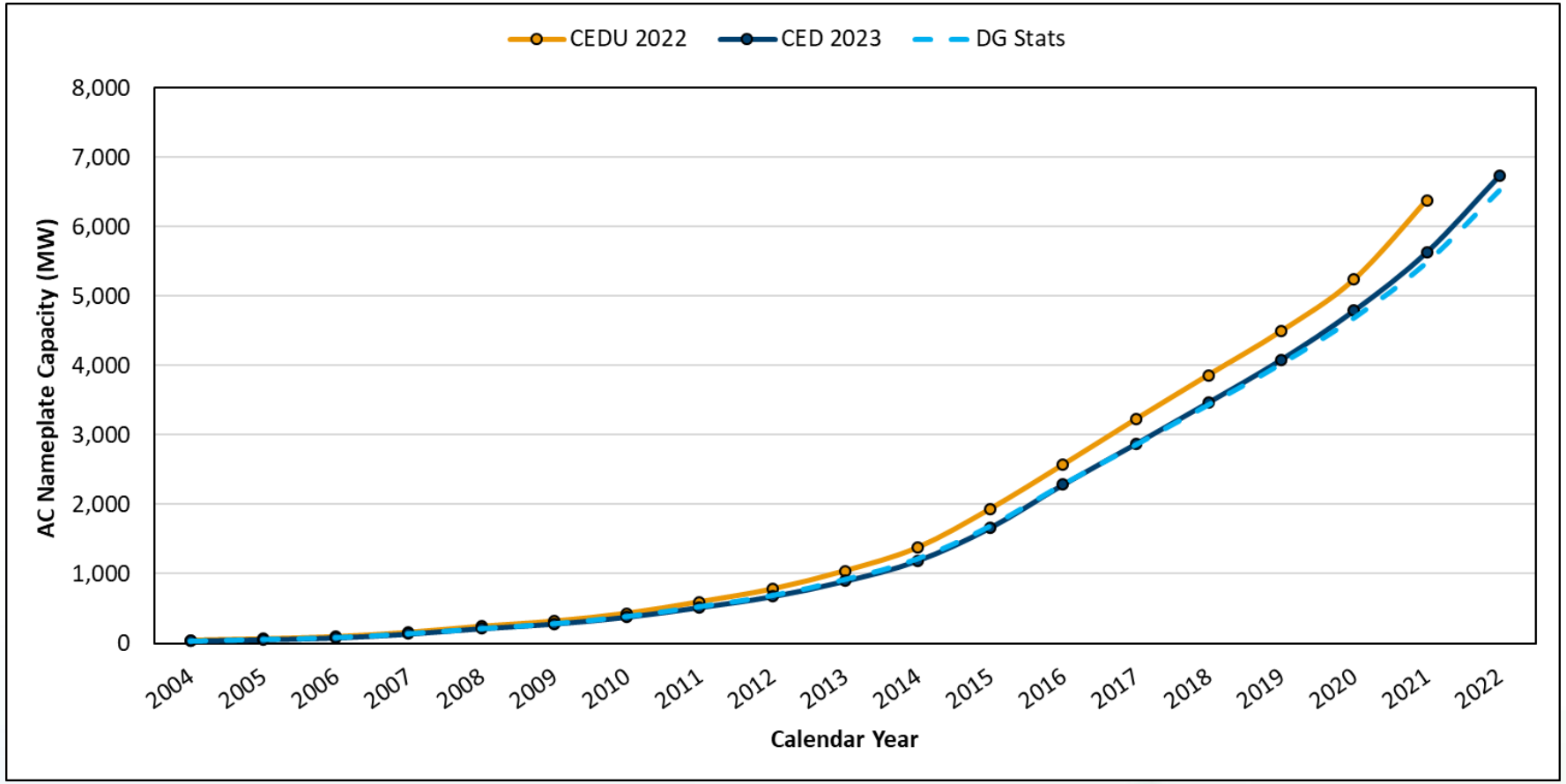
- This estimate covers PG&E, SCE, and SDG&E service territories.
- CED estimates includes NEM **and** Rule 21 Non-Export interconnection agreements.

Year	DG Stats (MW)	CEDU 2022 (MW)	CED 2023 (MW)
2021	10,551	11,846	10,818
2022	12,626		12,870



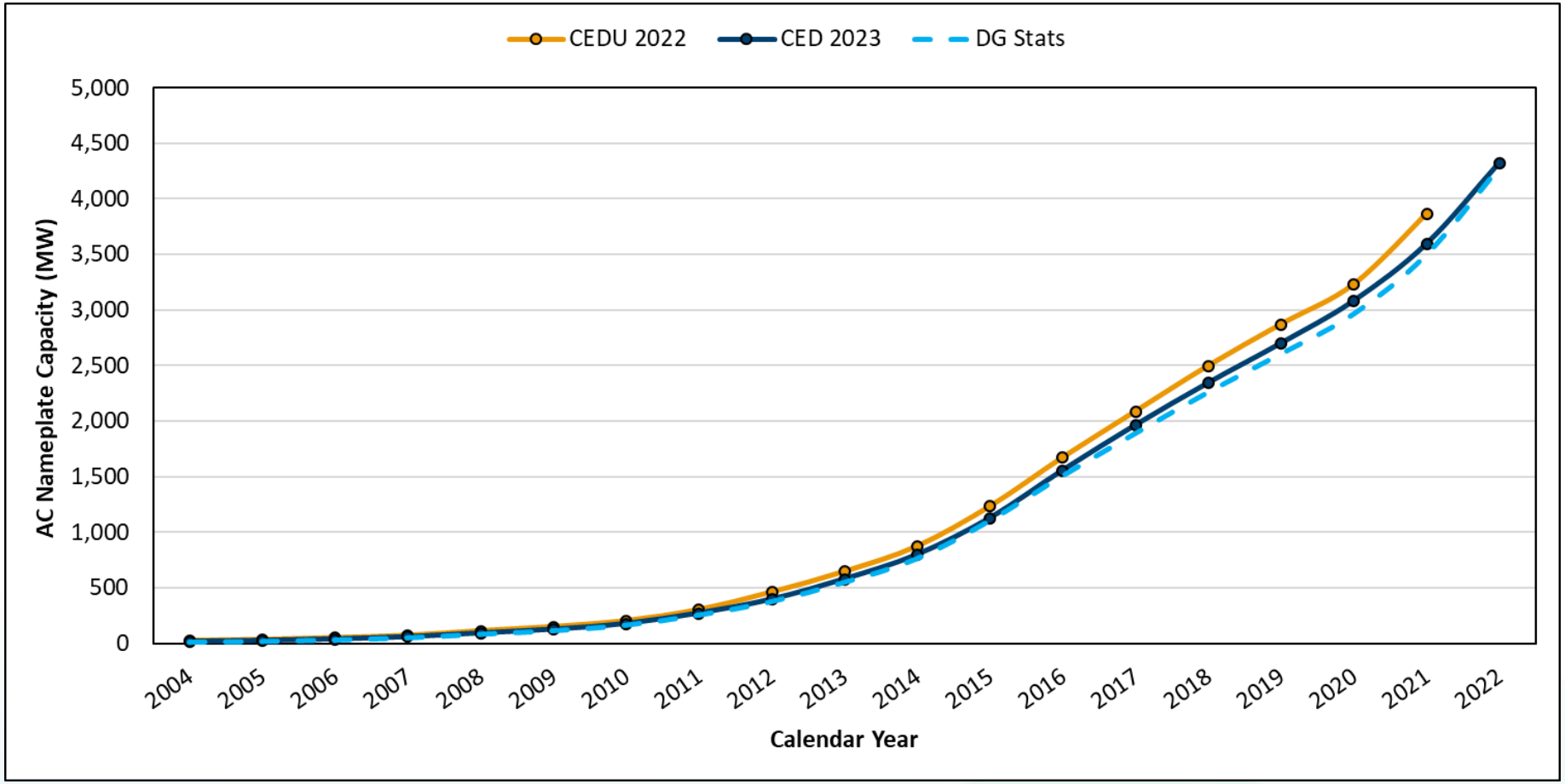
Historical BTM Solar Adoption: PG&E Service Territory

Year	DG Stats (MW)	CEDU 2022 (MW)	CED 2023 (MW)
2021	5,475	6,380	5,633
2022	6,511		6,733



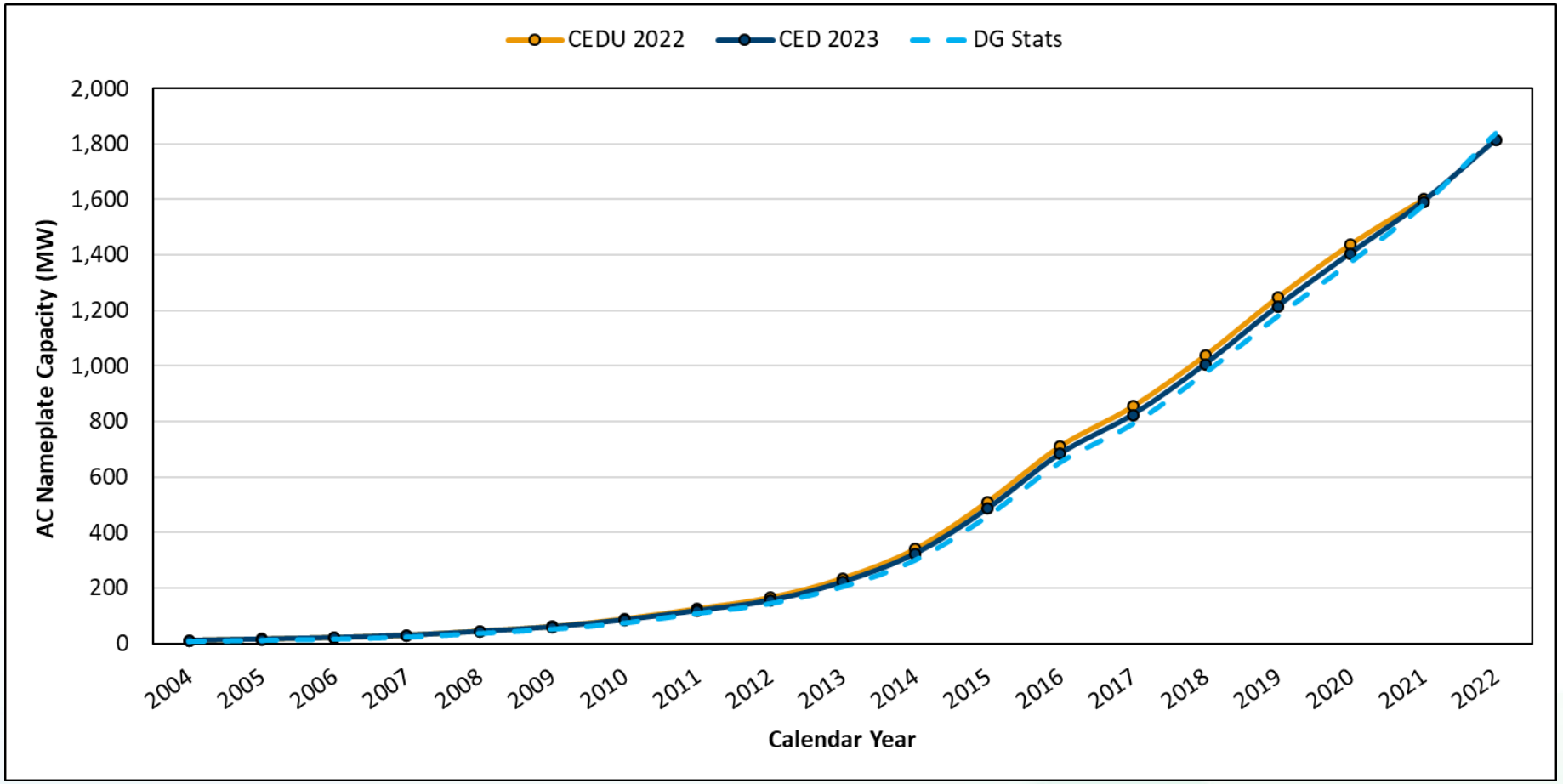
Historical BTM Solar Adoption: SCE Service Territory

Year	DG Stats (MW)	CEDU 2022 (MW)	CED 2023 (MW)
2021	3,497	3,865	3,594
2022	4,276		4,323



Historical BTM Solar Adoption: SDG&E Service Territory

Year	DG Stats (MW)	CEDU 2022 (MW)	CED 2023 (MW)
2021	1,580	1,601	1,591
2022	1,839		1,814



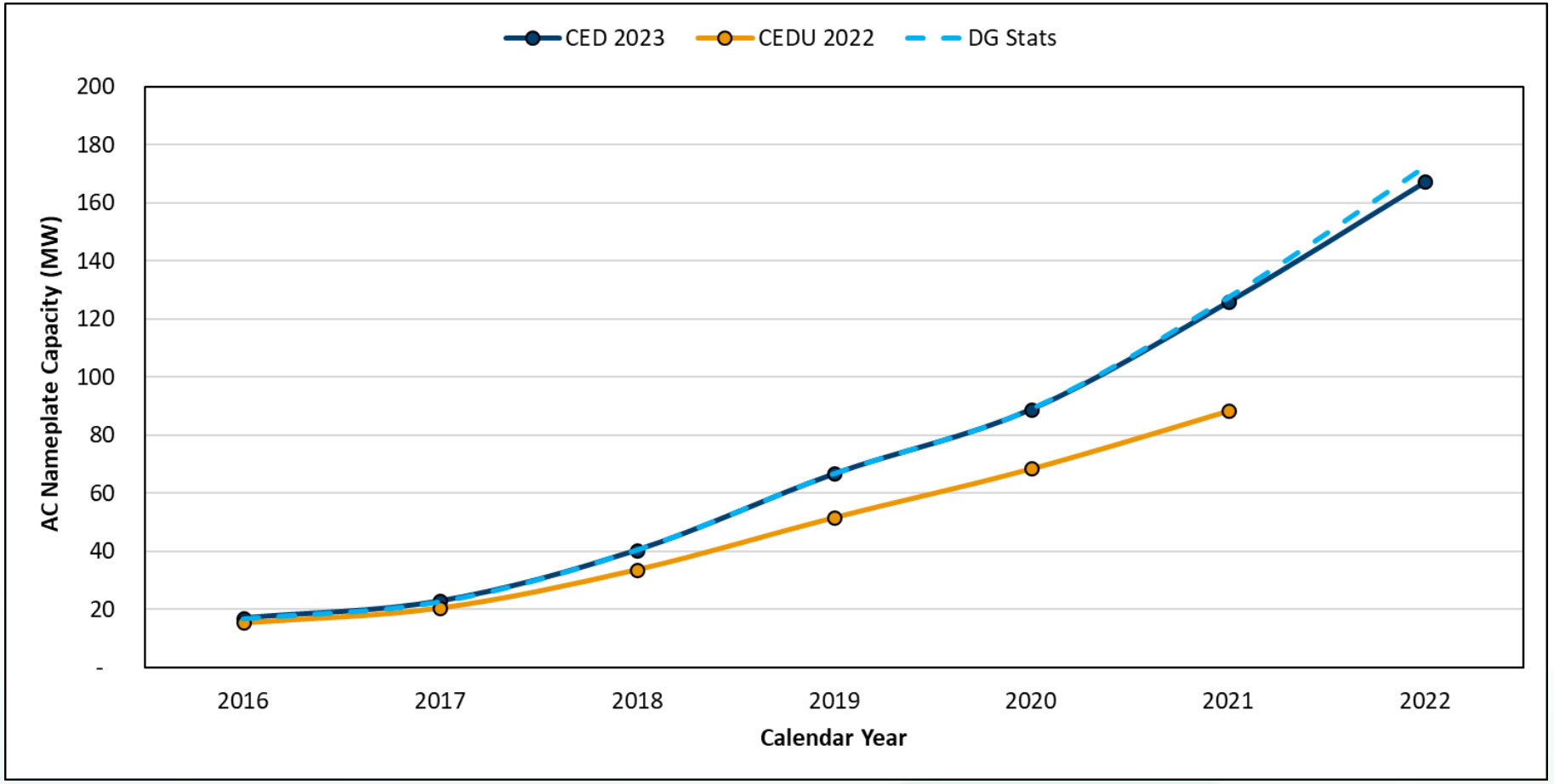
Historical BTM Storage Adoption

Storage Charts Notes

- Previous CED estimates are based off SGIP and Rule 21 interconnection data.
  - CED 2023 estimates are derived from UDC interconnection data.
- CEC staff reached out to IOUs and CPUC to resolve discrepancies shown in the following slides.
  - Staff will provide updated storage estimates as soon as possible.

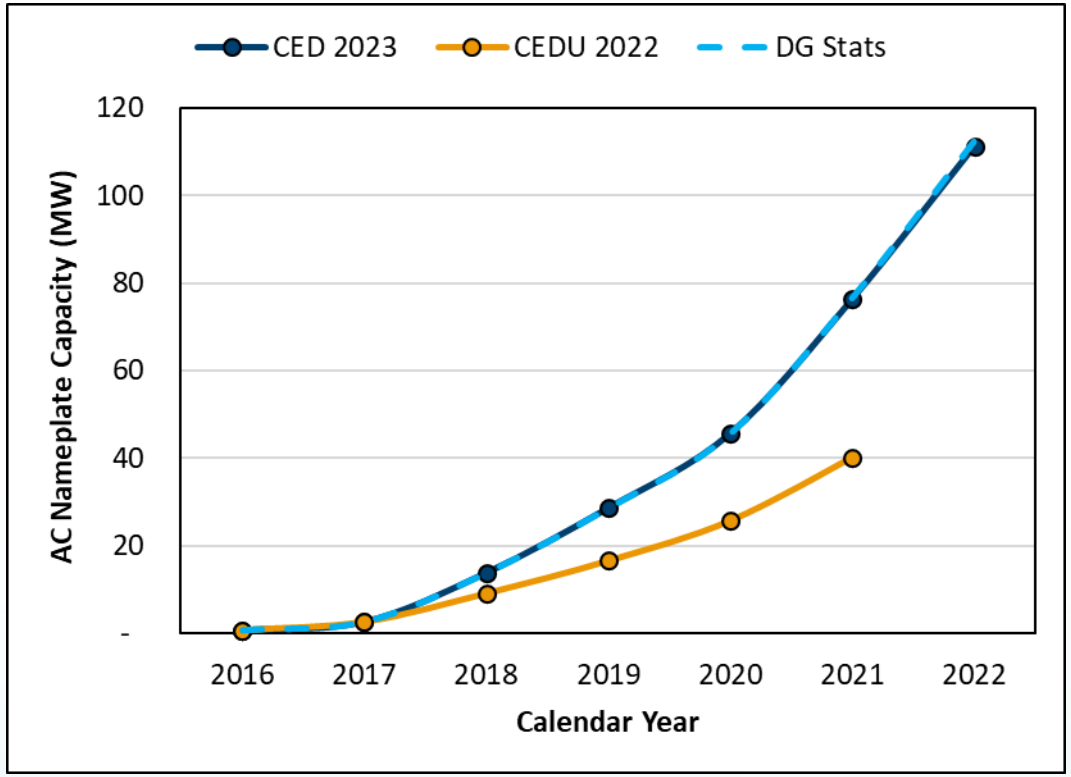
Historical BTM Storage Adoption: SDG&E Service Territory

Year	DG Stats (MW)	CEDU 2022 (MW)	CED 2023 (MW)
2021	127	88	126
2022	172		167

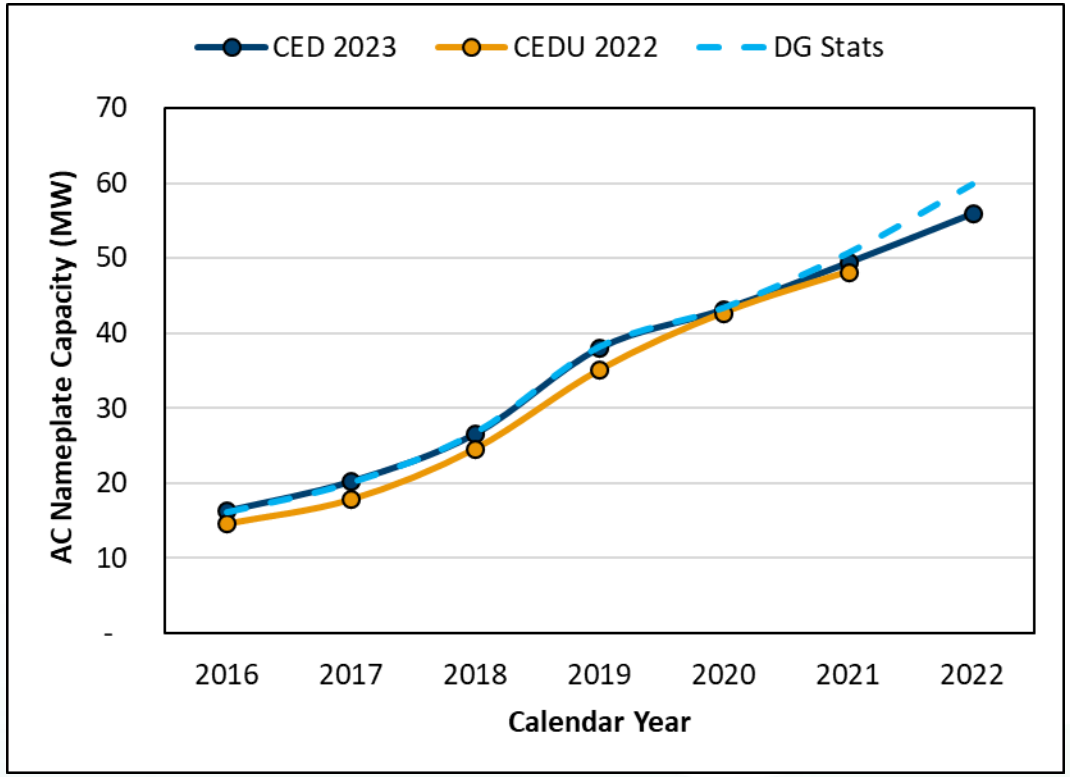


Historical BTM Storage Adoption: SDG&E Service Territory by Sector

Residential

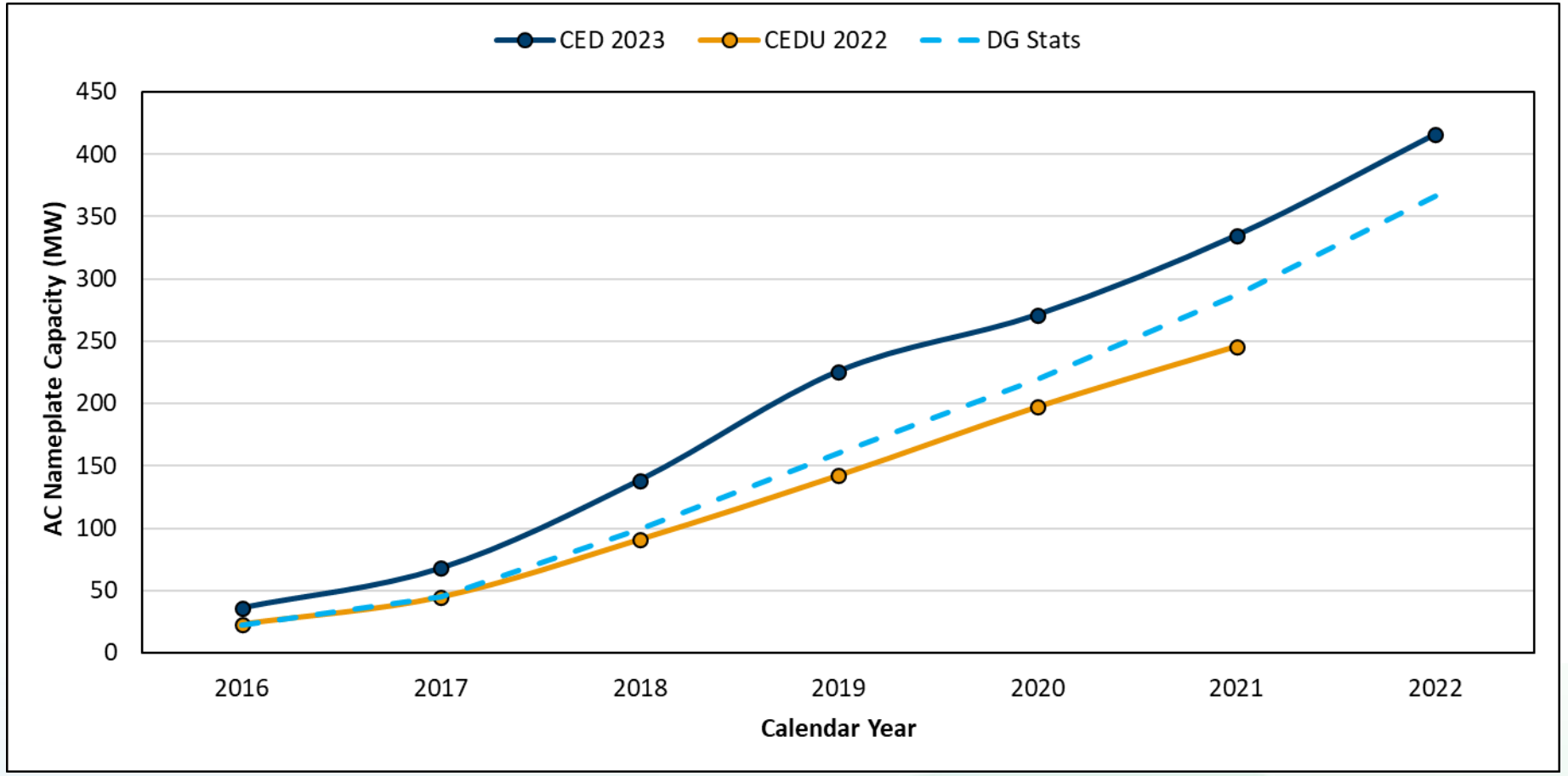


Non-Residential



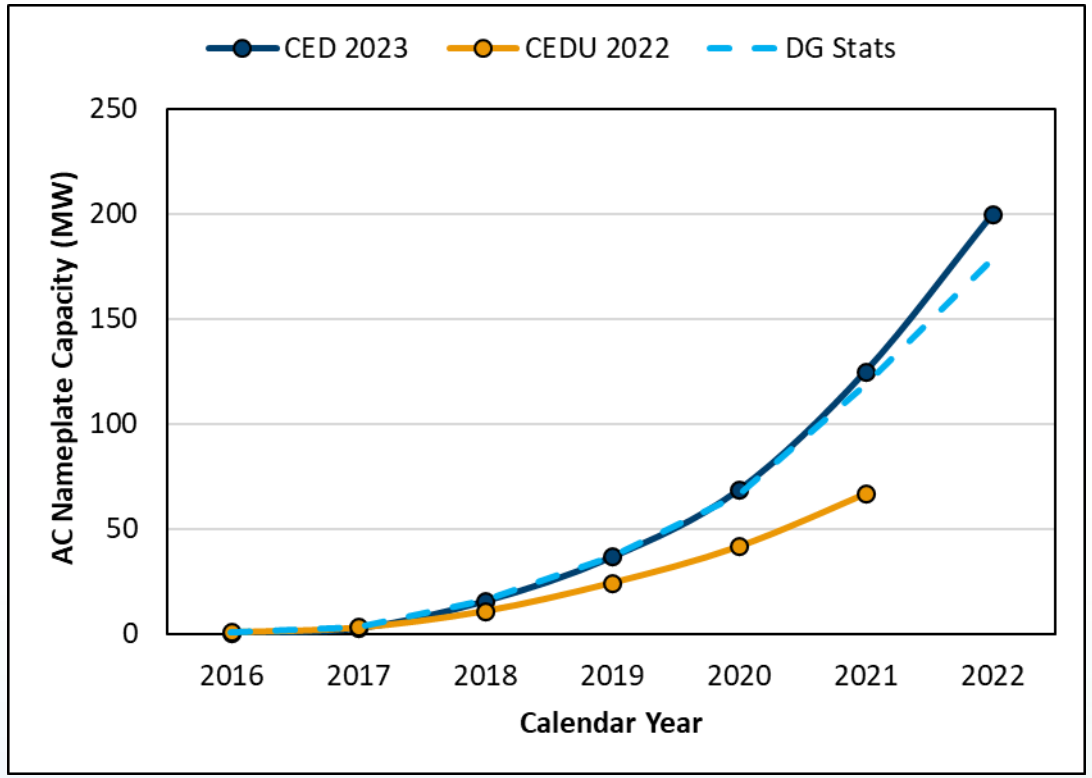
Historical BTM Storage Adoption: SCE Service Territory

Year	DG Stats (MW)	CEDU 2022 (MW)	CED 2023 (MW)
2021	287	246	335
2022	367		416



Historical BTM Storage Adoption: SCE Service Territory by Sector

Residential



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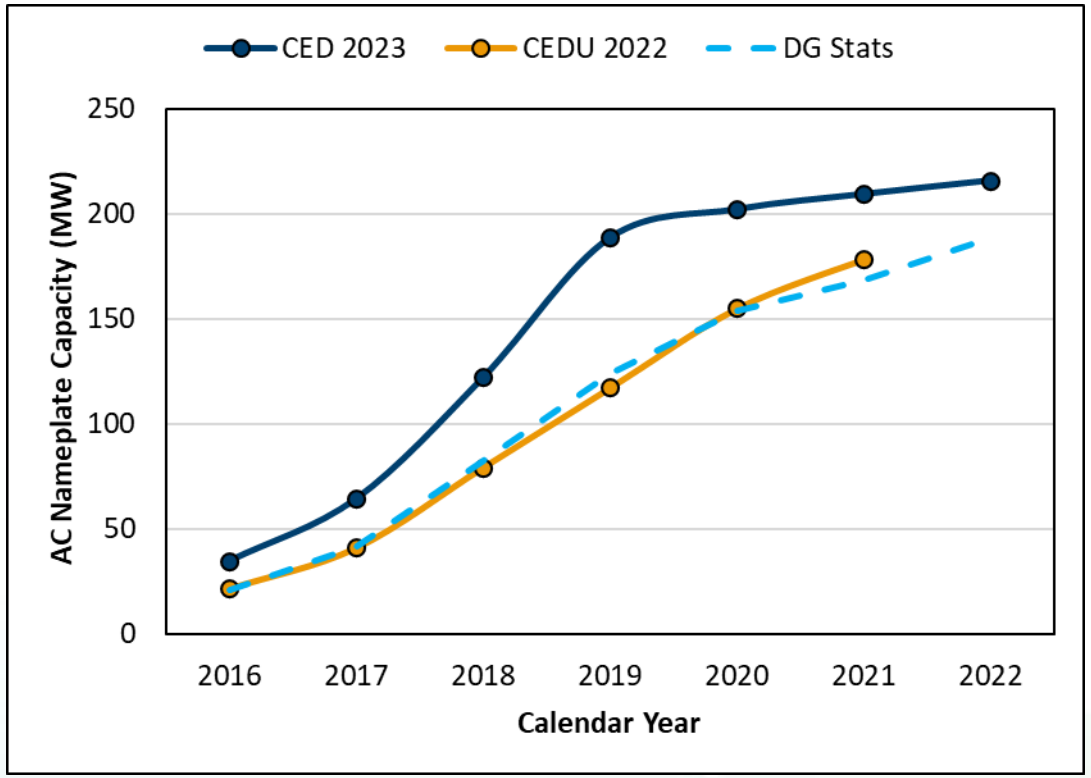
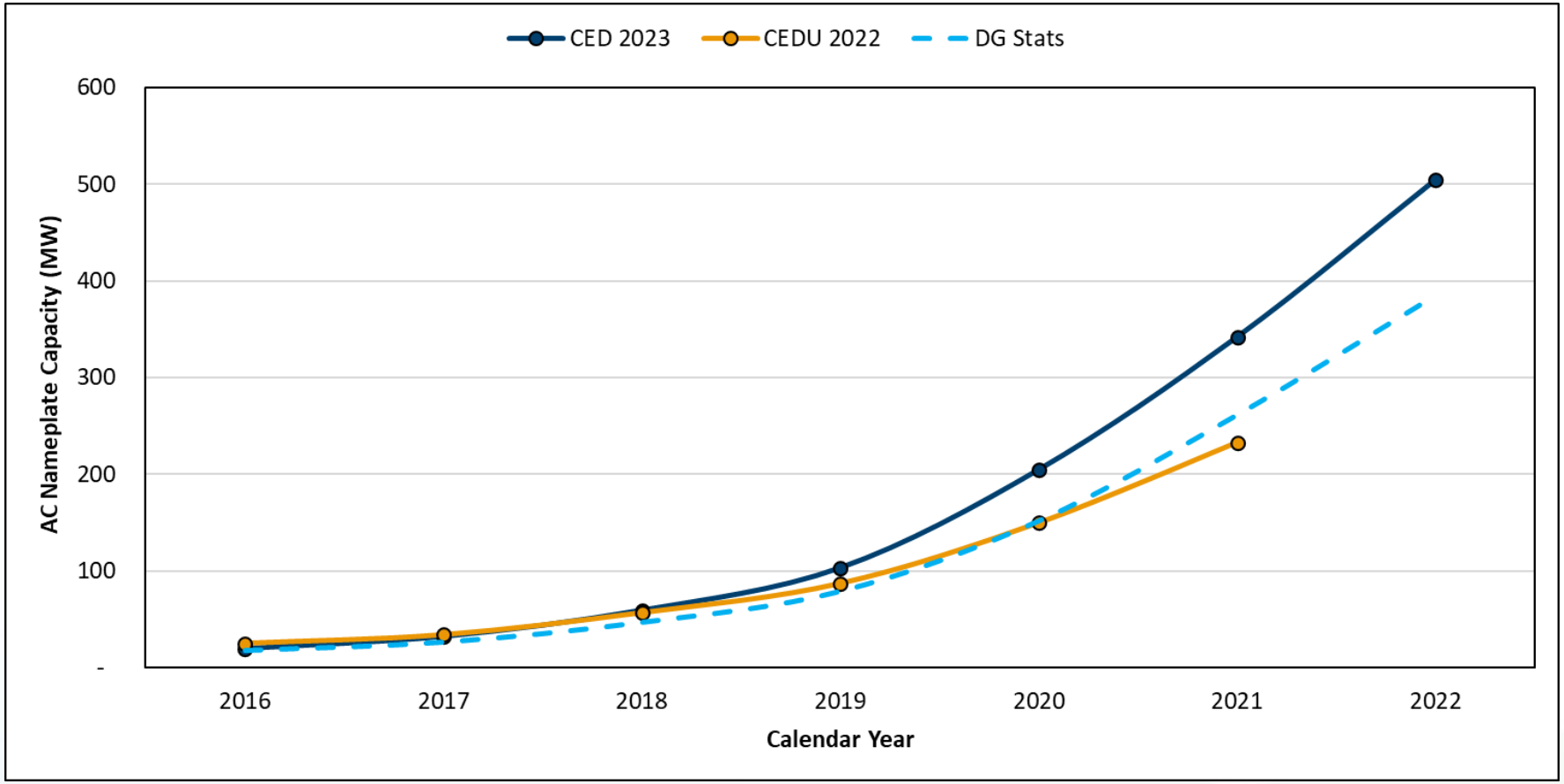


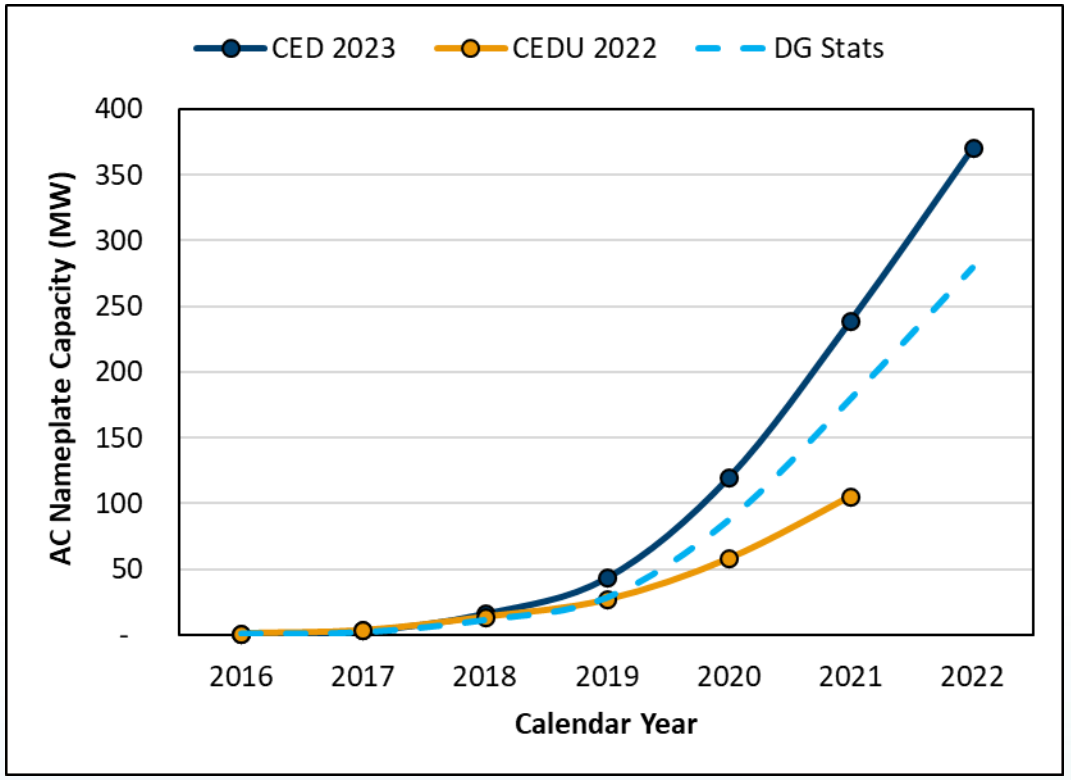
Historical BTM Storage Adoption: PG&E Service Territory

Year	DG Stats (MW)	CEDU 2022 (MW)	CED 2023 (MW)
2021	262	233	342
2022	385		505



Historical BTM Storage Adoption: PG&E Service Territory by Sector

Residential



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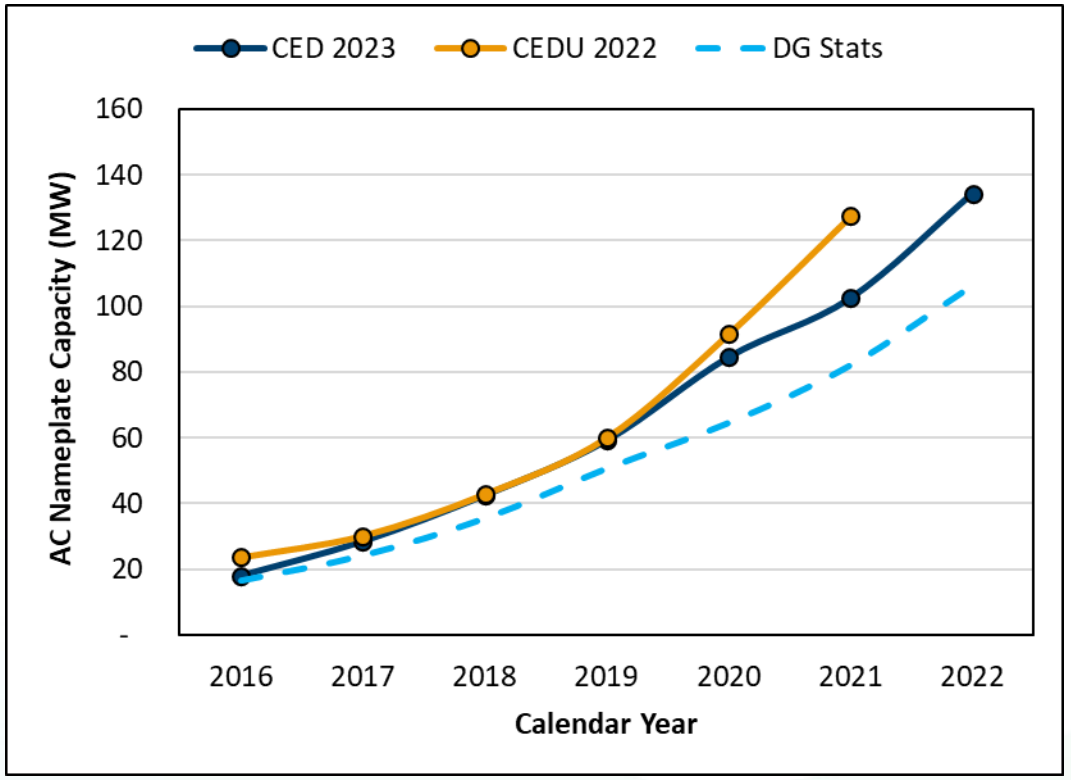


Improvements to 2023 Forecast

dGen Model

- Energy Commission worked with the National Renewable Energy Laboratory (NREL) to develop a California-specific version of their Distributed Generation (dGen) model.
- CEC will use this model to forecast adoption of standalone PV and PV + storage for CED 2023.

What is dGen?

- dGen is a market-penetration model which simulates adoption of DG technologies
  - Market diffusion model determines the rate of DG adoption and maximum market share from modeled economic potential
  - As more consumers adopt DG technologies, there are fewer available adopters in future years
- The California Specific dGen model:
    - Incorporates updated policies including:
      - Net Billing Tariff
      - Investment Tax Credit

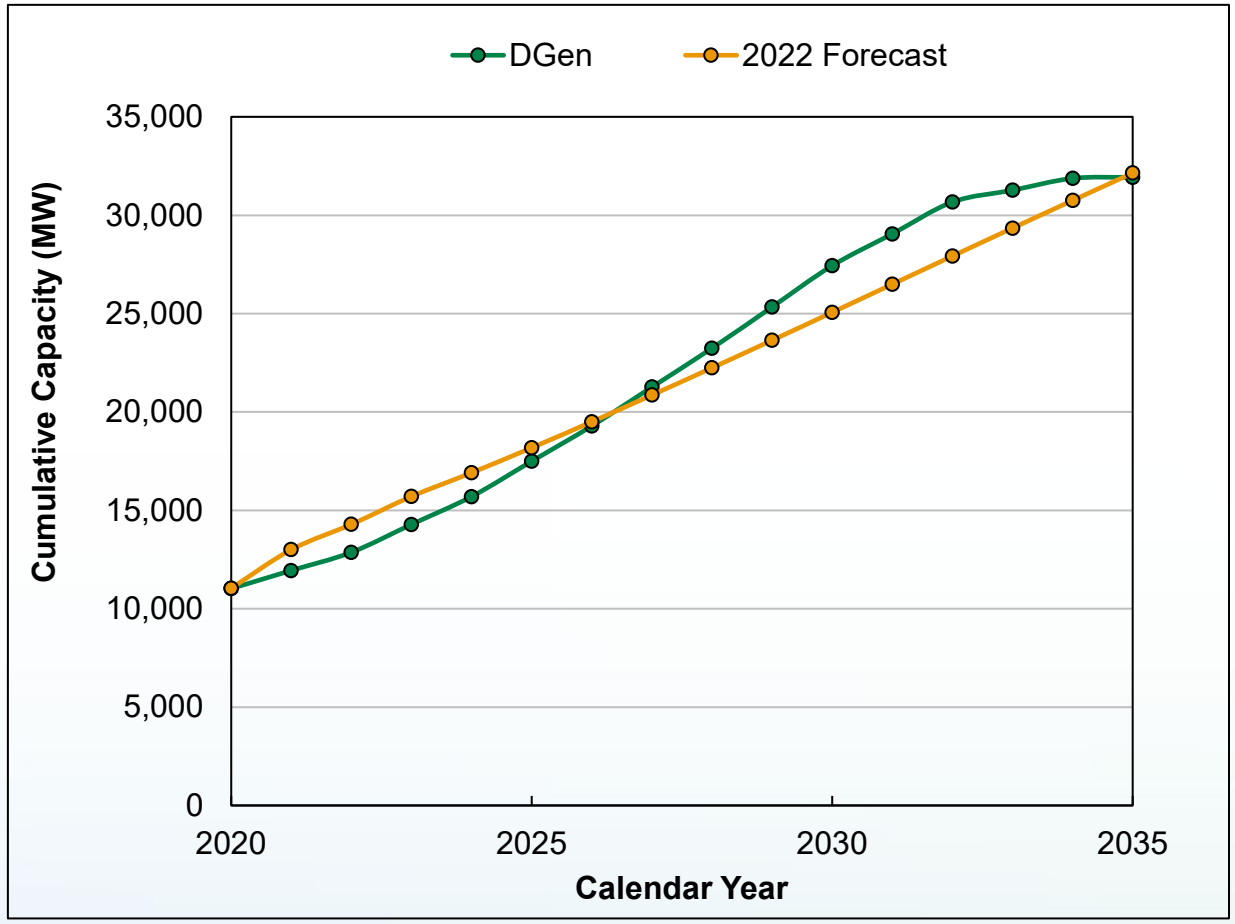
Net Billing Tariff Update

- The Net Billing Tariff (NBT) was adopted by CPUC in late 2022 as a replacement for Net Energy Metering (NEM 2.0)
- Went into effect April 2023
- Electricity exported to the grid is compensated in accordance with the Avoided Cost Calculator (ACC)
    - ACC values excess energy exported to the grid based on marginal costs of providing electric service to customers; this amount is credited to customer
    - PG&E and SCE customers receive additional credits to make payment reduction more gradual (glide path)

Investment Tax Credit Update

- Federal Investment Tax Credit (ITC) extension was announced in August 2022
  - Most recent extension is part of Inflation Reduction Act (IRA)
  - Now extended through 2034; this extension is incorporated into the DG forecast
  - IRA also introduced new tax credit for standalone storage installations
  - Provides tax credit of up to 30% of installation cost

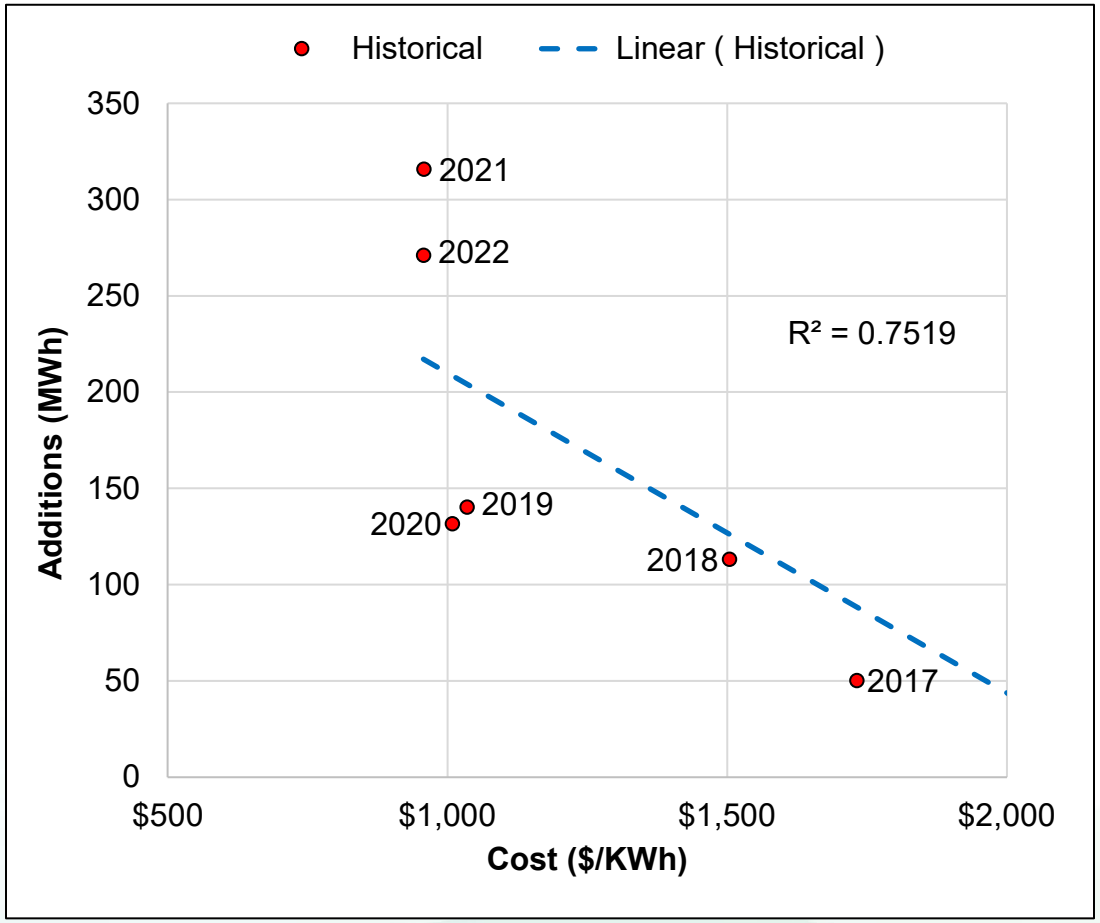
Preliminary Comparison of Models



- Staff compared preliminary results from dGen model to finalized CEDU 2022 forecast
- Staff expects
  - NBT to have a downward effect on solar adoption (longer payback period due to lower compensation rates)
  - ITC extension to have an upward effect on solar adoption

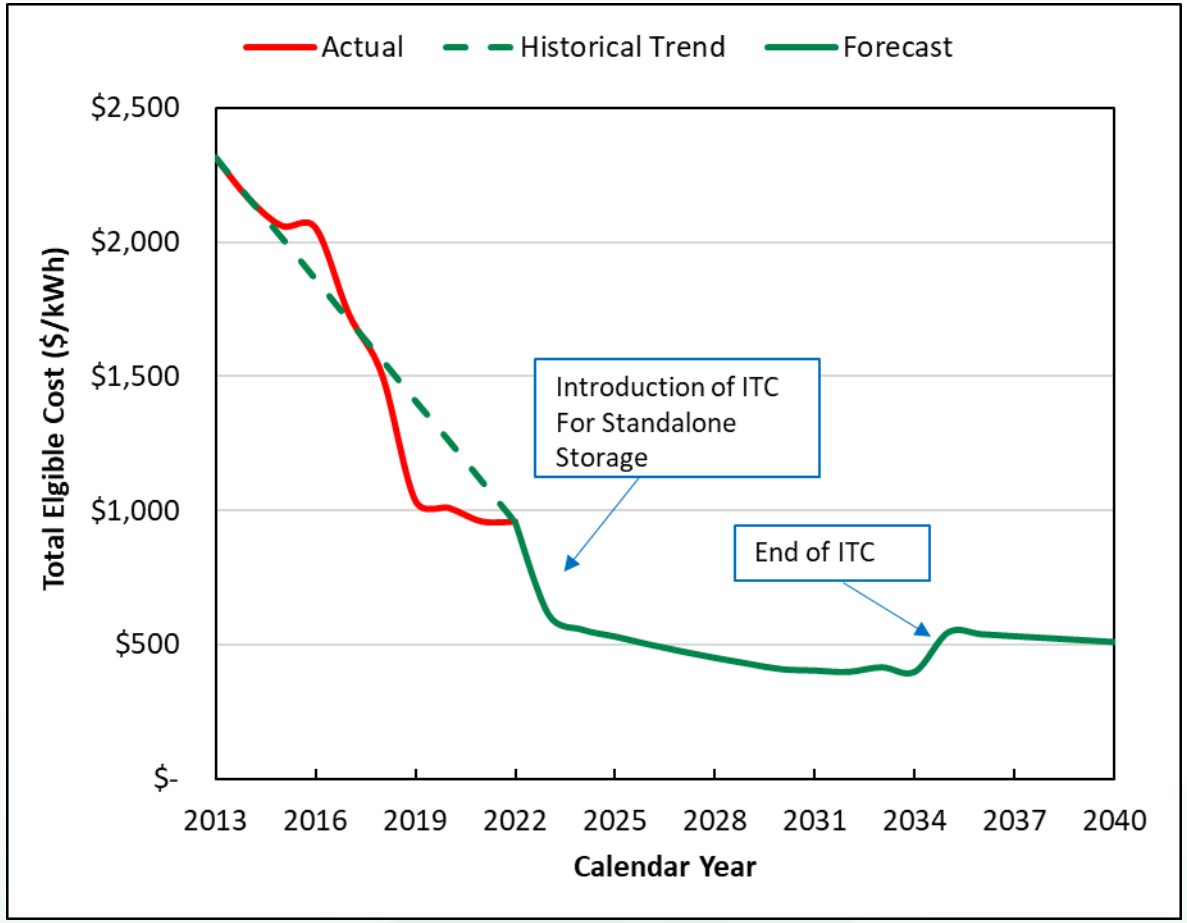
Standalone Storage Model

- Commercial Standalone Storage is modeled separately from paired storage
- SGIP historical storage installation costs are used in conjunction with SGIP historical storage additions to develop a linear regression model
- Forecasted storage additions are determined from projected storage costs, which serve as input to the linear regression model



Standalone Storage Model (Cont.)

- To extend costs through the forecast period, staff used NREL's Annual Technology Baseline data to calculate annual percent decrease in cost
- Our preliminary forecast results show annual storage capacity additions increasing 35% by 2040
- Comparison results to CEDU 2022 will be available at a future workshop



Title 24 Updates

- Staff forecast PV installations due to Title 24 Building Standards separate from dGen
  - dGen captures adoption for existing building stock
- Standards require new buildings (both residential and nonresidential) to include solar PV installations
  - In 2021, the Energy Commission adopted the 2022 standards, which went into effect at the beginning of 2023—note that we already forecast standards compliance
- Staff are working with the Standards Compliance Branch in CEC's Efficiency Division to leverage certificate of installation data to more accurately estimate the capacity of compliance-based residential solar PV.
- Staff will use updated Commercial Buildings Energy Consumption Survey (CBECS) data to reflect latest survey (2018 vs. 2012)
  - Survey is used to gather information on buildings (e.g., type, floors, tenants) that affects commercial PV requirements

Thank you!

Link to August 8 DAWG Meeting With More Info:
https://www.energy.ca.gov/event/workshop/2023-08/ca-energy-demand-forecast-distributed-generation-updates-and-residential