

Distribution Forecasting Working Group

Energy Storage Assumptions & Forecasts

May 16, 2018

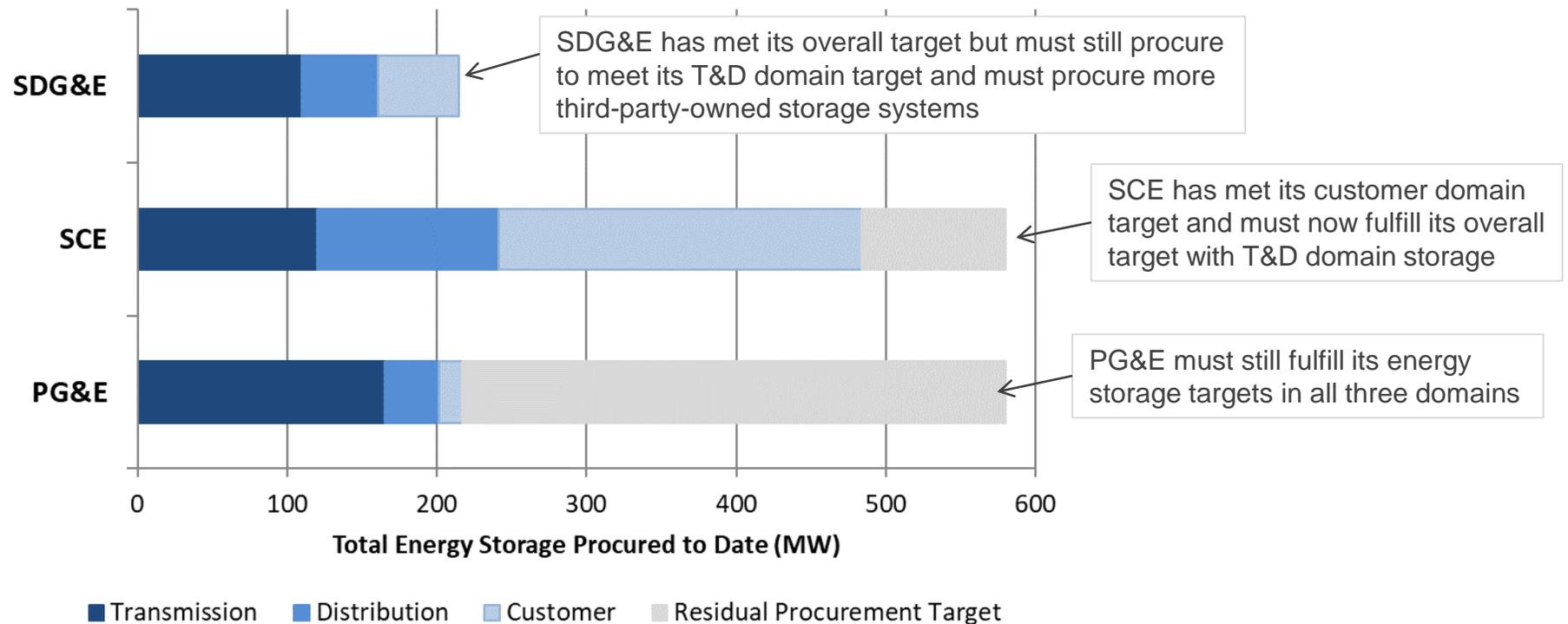


Background

- **Energy storage operational assumptions and load impacts are important to overall load forecasting and distribution planning:**
 - Supports more accurate hosting capacity analysis
 - Sends DER providers with accurate signals to be sited at locations with highest benefit (as reflected in ICA and LNBA values)
 - Better enables multiple-use applications (MUAs) by more accurately determining incrementality based on baseline planning assumptions
- **CESA supports the goals of the DRP to support distribution planning by:**
 - Increasing the utilization and cost-effectiveness of grid assets
 - Enabling DER participation through greater transparency and accurate signals
 - Understanding how DERs can mitigate or avoid deficiencies
 - Advancing decarbonization goals at reasonable cost

State of the Energy Storage Market

- Each of California's three investor-owned utilities (IOUs) are making major progress toward their 1,325 MW energy storage procurement target by 2020:



Updated February 2018

Source: CESA compilation of AB 2514 compliance filings and applications for approval

Early Storage Adopter Characteristics

- **Most storage customers are motivated by bill savings:**
 - Residential customers on NEM are motivated by energy arbitrage if on TOU rates (NEM 2.0) though differentials are not significant enough
 - Commercial and industrial (C&I) customers are motivated by demand charge savings, with ES providers targeting customers with ‘peaky’ loads to generate the most \$/kW savings
 - Operating profiles for residential customers may look very differently than C&I customers
- **Many customers are motivated to install storage for backup or resiliency purposes, but such adopters may be less relevant here for distribution planning:**
 - Ineligible for SGIP incentives
 - Storage used solely for backup purposes are not dispatched frequently to impact distribution planning

Status Quo: CEC System Forecast

- **CESA's understanding of CEC approach (“placeholder analysis”) creates an opportunity to consider different approaches:**
 - Energy storage operational impact is simplified to assume 90% peak impact relative to nameplate rating
 - Responses and load impacts to TOU rates are incorporated into IEPR analysis, but they are not specific to storage
 - Forecasts for BTM storage are assumed with constant annual additions from base year based on SGIP project trend analysis
- **The CEC indicated that it will consider a technical support contractor to come up with a better approach and/or create a predictive model**

Status Quo: IOU Distribution Forecast Allocation

- **CESA seeks to understand IOU disaggregation methods but also understands the current drivers of uncertainties in allocations:**
 - Extremely limited historic data (adoption, location)
 - Dispatch behavior not guaranteed (multiple use, changing rates, changing program enrollments, changing load)
 - DER interactions not yet modeled (solar+storage, V1G+storage)

Policy Drivers for Energy Storage Adoption

Policy / Program	Description	Key Upcoming Changes
Self-Generation Incentive Program (SGIP)	<ul style="list-style-type: none"> • Almost \$400M in upfront and performance-based incentives made available for commercial, industrial, public, and residential BTM ES systems • 25% carve-out in Equity Budget • Must meet operational requirements (cycling, RTE) and not be used for backup • Dual participation in DR allowed 	<ul style="list-style-type: none"> • TBD changes to operational requirements to meet GHG compliance requirements (deemed compliant pathways, GHG signal) • TBD whether legacy systems will be placed under new operational requirements
Net Energy Metering (NEM)	<ul style="list-style-type: none"> • NEM 2.0 maintains NEM 1.0 except for NBCs and requirement to be on existing TOU rate structures • Paired ES > 10 kW required to < 150% of NEM generator's maximum output capacity • Paired ES ≤ 10 kW not required to be sized to the customer demand or NEM generator 	<ul style="list-style-type: none"> • NEM 3.0 tariff development starting in 2019 • Additional smart inverter requirements
AB 2514 Deployments	<ul style="list-style-type: none"> • Biennial applications for ES-specific procurements, but also can count other all-source procurements (LCR, IDER) • SGIP projects count toward targets 	<ul style="list-style-type: none"> • Only one more biennial cycle left • TBD whether SB 1347 passes
AB 2868 Investments & Programs	<ul style="list-style-type: none"> • Each IOU authorized 166.66 MW of ES with focus on low-income and public-sector customers • Incorporated into biennial applications • Incremental to AB 2514 procurements 	<ul style="list-style-type: none"> • TBD on specific programs/investments • No specified timeline for programs/investments

Policy Drivers for Energy Storage Adoption

Policy / Program	Data Characteristics	Key Uncertainties
Self-Generation Incentive Program (SGIP)	<ul style="list-style-type: none"> Rated ES kW and kWh capacity Whether ES paired with renewables Customer sector Date of installation (incentive paid) Location (city, county, zip code) 	<ul style="list-style-type: none"> Program is only funded through 2019 and uncertain future funding Requires mapping host customer NAICS/SIC code to rates Assumptions (or lack of) on other revenue streams (e.g., DR)
Net Energy Metering (NEM)	<ul style="list-style-type: none"> Rated PV size Whether NEM 1.0 or NEM 2.0 Customer sector Date of application completed Location (city, zip code) 	<ul style="list-style-type: none"> Avoid double counting SGIP projects No data on storage pairings Requires assumptions on storage sizing Requires assumptions on operational profile Whether new smart inverter requirements may address needs otherwise served by ES
AB 2514 Deployments	<ul style="list-style-type: none"> Location data for IFOM distribution-connected projects Contract data for specific operational profile (mostly RA but also MUAs) 	<ul style="list-style-type: none"> Avoid double counting SGIP projects Uncertain location data for aggregated BTM projects Lumpy investments and specific needs Deployment only through 2024 (IRP takes over?)
AB 2868 Investments & Programs	<ul style="list-style-type: none"> Location data for specific investments Contract data for specific operational profile (MUAs) 	<ul style="list-style-type: none"> Lumpy investments and specific needs Flexible deployment schedules

CESA's Recommendation

- **Consider CESA's proposed approach (next slide) to establish bottom-up forecasts:**
 - Is it necessary to start with a CEC system-level forecast and disaggregate down?
 - BTM ES is very customer and rate specific
 - Locational data is available in SGIP database
- **Focus on SGIP data to map out historical adoption trends and develop a baseline from which to set aggregate forecasts:**
 - Most BTM ES deployed using SGIP funds to offset upfront costs
 - Operational requirements in place to ensure non-backup use, with SGIP-funded systems being deployed to provide customer services
 - No need to model based on IOU procurement to establish forecast, though it can be included in baseline
 - AB 2514 procurement is for non-SGIP systems but they are lumpy investments and hard to include in forecasts
 - AB 2514 procurement for BTM ES is for supply-side resources and is an *incremental* service above the demand forecast
 - AB 2868 programs (e.g., ES for CARE facilities) are still TBD and are small by comparison to SGIP funds

Potential Method for BTM ES Forecasting

- **Build off NREL's Distribution Generation Market Demand (dGen) model and adapt it to BTM ES potential adoption:**
 - Calculate the economic attractiveness (e.g., payback period) of potential adoption
 - Use agent-based model that calculates bill savings using representative hourly generation and consumption profiles (from OpenEI database) and specific or possibly 'blended' rate structures
 - Determine specific attributes of customer subsets (e.g., peaky loads for C&I, > \$15/kW coincident peak demands) to set maximum addressable market
 - Forecast potential adoption across specific customer subsets using 'S-curve' model (similar to what the IOUs do for rooftop PV) based on assumed BTM ES cost declines and SGIP incentive rate step-downs
 - For residential customers, economic attractiveness may not be sufficient
 - Determining the total addressable market may require using correlating factors like household income (similar to correlating factors for PV)
 - Sensitivity to payback periods may need further review for different customer bases using this approach

Potential Method for BTM ES Forecasting

- **Potential limitations of this approach:**
 - There may not be enough customers in specific location or customer subset to forecast BTM ES adoption using S-curve approach
 - Are there privacy concerns with this bottom-up approach that requires looking at customer composition by circuit? Is this done in the IDER RFOs?
 - This approach is sensitive to assumptions on BTM ES costs
 - This approach focuses exclusively on economic drivers for adoption, not other factors such as resiliency and environment
 - This approach does not capture potential charge/discharge timing and magnitude
 - Determining this is likely easier for solar+storage systems that require 100% charging from solar for NEM or at least 75% charging for ITC purposes
- **It is important to note that we are not trying to model and forecast all ES operational profiles but to focus on developing the ‘baseline’ forecast for BTM ES adoption for customer services**

Key Takeaways

- **We should focus on BTM ES providing customer services since this will be the priority for driving adoption**
- **BTM ES operations are complex and variable depending on customer load profile, customer sensitivity to costs/payback, rate schedule:**
 - Thus it may be worthwhile to consider a bottom-up approach given rich SGIP dataset and lack of robust and proven system-level forecasting for BTM ES at this point
- **CESA is open to different approaches and is eager to contribute**

Questions?

Jin Noh
Policy Manager, CESA
jnoh@storagealliance.org
703-507-8809