

**CALIFORNIA ENERGY STORAGE POLICY**

**STORAGE POLICY SNAPSHOT**

<i>Does California have an renewables mandate?</i>	YES. 50 percent renewables by 2026 and 60 percent renewables by 2030
<i>Does California have a state mandate or target for storage?</i>	YES. 1,325 MW by 2020
<i>Does California offer financial incentives for energy storage development?</i>	YES
<i>Does California have a policy for the strategic deployment of Non-Wires Alternatives or Distributed Energy Resources to defer, mitigate, or obviate need for certain T&amp;D investments?</i>	YES
<i>Does California have a policy addressing multiple use applications for storage?</i>	YES
<i>Does California have a policy on utility ownership of storage assets?</i>	YES
<i>Does California allow or mandate the inclusion of energy storage in utility IRPs?</i>	YES
<i>Has California modified its permitting or interconnection requirements specific to energy storage?</i>	YES
<i>Does California allow customer-sited storage to be eligible for net metering compensation?</i>	YES
<i>Has California revised its rate structures to drive adoption of behind-the-meter storage</i>	YES
<i>Approximate development of storage capacity in California</i>	Approximately 4.2 GW

## **STORAGE POLICY ASSESSMENT**

With its innovative and ambitious policies, California is a global leader in the development and application of energy storage technologies. For the last decade, the state has been a frontrunner in both the development of storage technologies and the legislative and regulatory policies that are needed to enable the growth of a storage marketplace.

It is clear that California has set the course for developing a clean energy future, a course that other states continue to monitor and, in several cases, mirror in their own policies. The specifics of California's clean-energy infrastructure are impressive. As of 2018, California has generated about 29 percent of its power from renewables. Another 9 percent came from nuclear and 15 percent from large hydropower (both of those count as carbon-free, but the last remaining nuclear plant in the state is slated to retire by 2025). Natural gas provided 34 percent of California's electricity. Further, since 2010, California has procured 1,514 MW of new energy storage capacity to support grid operations. Also in 2010, California became the first U.S. state to mandate energy storage procurement with targets imposed on the state's three investor-owned utilities (Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric, formalized by the California Public Utilities Commission (CPUC).

California recently upped the ante on its clean-energy goals, with its newly established goal to generate 60 percent of its generation from renewable resources. In addition, California has adopted a 100 percent carbon-free electricity by 2045.

Energy storage factors prominently into California's clean energy goals, and in fact some market observers have concluded that California's goals are not achievable without a significant amount of new storage capacity being developed over the next two decades. Policymakers in the state appear to agree on the critical role that storage will play going forward, and in 2018 through legislative and regulatory policy the state formally adopted a new energy storage target of 1,325 MW by 2020. This mandate is the outcome of California's conclusion that energy storage will continue to be a main ingredient in the mix of strategies the state is using to balance supply and demand, support the California Independent System Operator (CA ISO) in maintaining grid stability; avoid voltage and frequency imbalances; and support the state's transition to a renewables-centric energy infrastructure.

With approximately 4.2 GW of energy storage capacity already in development, California has a large amount of installations that can be analyzed and used to inform related policy decisions. California also has been a pioneer in testing and utilizing large-scale lithium-ion battery deployments as a swift response to compromised grid conditions, and is the location for prominent demonstrations intended to evaluate storage technologies for various grid-scale applications, including PG&E's use of batteries to replace gas-powered plants that are shutting down. Moreover, due to the sheer volume of California's energy storage development and the

fact that it has wrestled with what will ultimately be critical storage policy issues for other states, it is no surprise that California has become the benchmark against which policies and market development for storage across the U.S. are being evaluated.

California has used a mix of executive directives, legislation, and regulatory decisions to define energy storage policy, and has relied upon coordinated efforts among the Legislature, CA CPUC, California Energy Commission (CEC), and the CA ISO. The policy initiatives related to storage that have been developed by California policymakers over the last decade have been focused in three key areas:

- Requiring utilities to procure significant amounts of new energy storage resources;
- Developing robust incentives through the Smart Grid Incentive Program) that provides consumer rebates to enable storage development (totaling about \$450 million in 2019); and
- Evaluating the value of energy storage through consideration of multiple use applications (MUAs) (i.e., storage's many contributions to grid stability and reliability).

Through these efforts, California has addressed a number of complex technology and policy factors including storage's role in a clean-energy environment, how a storage market should be designed, barriers that prevent storage's participation in both retail and wholesale markets, and the various ways in which storage can and should be used. Given that the state's legislators opted not to define specific paths for storage development but rather deferred to regulators and market drivers, California has experienced somewhat of a "learning by doing" process as it pertains to developing its storage market. Accordingly, California's efforts provide many "lessons learned" for other states across the country, many of which have taken very few steps toward developing their own policies for storage. Key storage issues that California has addressed over the last decade include:

- Determining an appropriate amount to be included in a storage mandate;
- Defining a realistic and achievable timetable for storage procurement;
- Allowing flexibility in types of storage projects that will be considered;
- Providing financial incentives that are offered appropriately and fairly;
- Evaluating various ownership models for storage; and
- Determining the value for storage across a suite of MUAs

California has almost single-handedly jump-started the advanced storage industry by setting statewide mandates for renewables, storage and carbon-free electricity, but the state is still in the early stages of this rollout. That means utilities are still testing how storage works on the grid, and how it performs after several years of service, both of which are crucial to planning a grid that is all renewables

The challenges for the state to achieve its vision are significant. For example, according to a study prepared by the National Renewable Energy Laboratory (NREL), even with optimal grid improvements, California would still need an estimated 15 GW of additional storage just to reach 50 percent solar by 2030. That's more than 11 times the amount of storage mandated currently in California, and 66 times the total megawatts deployed in the U.S. last year. For now, though, California has solidified its leadership role in building the future paradigm for clean energy and the grid. If it succeeds, others will learn from it. If it falls short, that expensive experiment will be instructive, too.

### **EXECUTIVE DIRECTIVES**

California's commitment to a renewables-centric, clean energy infrastructure has been in place for almost two decades, building upon the policies enacted by Governors Arnold Schwarzenegger (R) (2003-2011) and Jerry Brown Jr. (D) (2011-2019) who pushed California toward becoming a global leader in decarbonization. California's current Governor Gavin Newsom (D) (2019-) campaigned with a pledge to issue a directive to put California on a path toward 100 percent renewables. While Newsom has not enacted any executive orders along these lines as of August 2019, it is anticipated that California will continue with its aggressive clean-energy objectives, which include a prominent place for energy.

The explicit support for green energy by the state's executive leadership has set the foundation for the number of legislative and regulatory policies enacted in recent years that have defined energy storage's role in California. It is important to view executive directives within the context of legislation and regulations that have followed and understand the role that executive leadership has played in jump-starting the energy storage market in California.

For instance, On June 1, 2005, Governor Schwarzenegger signed [Executive Order S-3-05\[1\]](#) which established greenhouse gas emissions targets for the state. The executive order required California to reduce its greenhouse gas emissions levels to 2000 levels by 2010, to 1990 levels by 2020, and to a level 80 percent below 1990 levels by 2050. However, to implement this measure, the California Air Resources Board (CARB) needed authority from the legislature. Consequently, Gov. Schwarzenegger was instrumental in the passage of California's signature clean energy legislation known as the Global Warming Solutions Act (AB 32) in 2006, which required the state to dramatically cut its greenhouse gas emissions. AB 32 also gave the CARB authority to implement the program.

Governor Brown continued executive support for clean-energy initiatives in California through his own executive orders. In his inaugural address in 2015, Governor Brown increased the state's target for renewable energy from 33 percent by 2020 to 50 percent by 2030, which subsequently codified with the passage of SB 350.

On April 29, 2015, Governor Brown issued [Executive Order B-30-15](#), which established a new greenhouse gas emissions reduction target for the year 2030. Governor Brown issued Executive Order B-55-18 in September 2018, just before he left office, which established California's goal of achieving statewide carbon neutrality by 2045. Governor Brown also signed two bills representing California's landmark legislation on energy storage: 1) SB 100, which establishes the state's goal of achieving zero-emission electricity by 2045, with 60 percent renewables to be achieved by 2030; and 2) SB 700, which provided expanded funding for energy storage and other emerging clean energy technologies, resulting in a total investment of \$1.2 billion for customer sited energy storage.

Furthermore, Both Governor Schwarzenegger and Governor Brown supported the expansion of the state's Self-Generation Incentive Program (SGIP) established in 2001. The SGIP has been California's way of encouraging residential installations of solar and energy storage systems.

## **LEGISLATION**

As a leader among states regarding energy storage policy development, California policymakers have driven the development of policy through the state legislature and public utility commission. As is often the case, legislation passed in California has established high-level objectives and goals for clean energy in general and energy storage, to then be implemented with more granular-level regulations created at the CPUC.

Goal-defining legislation passed in the state over the last decade has not only created the energy storage market in California but has also set defined important precedents that other states have referred to as they define their own storage markets. Taken as a whole, the suite of storage policy that has emerged out of legislation has positioned California as the most mature energy storage market in the U.S.

The key pieces of storage-focused legislation in California include:

- [AB 2514 \("Energy Storage Systems"\) \(2010\)](#)
  - AB 2514 was the first state law in the U.S. establishing a mandate for energy storage systems.
  - AB 2514 directed the CPUC to require California's investor-owned utilities to procure 1.3 GW of storage capacity by 2020, split among the transmission, distribution, and customer domains.
  - The targeted goal of 1.3 GW of storage was intended to be split evenly among the three investor-owned utilities.
  - The target is divided in sub targets related to storage at the transmission level, distribution level and at the end-user level, behind the meter. Targets are defined in power capacity (MW) without defining technology, ramp-up time, amount of energy (MWh) or duration. It is left to the market to

determine what kind of energy storage is the most cost effective and adds the most value to the electricity system.

- The legislation aims specifically at stimulating new types of energy storage for electricity such as compressed-air energy storage (CAES), battery-based energy storage, thermal energy storage, fuel cells and other technologies. It rules out large pumped hydro storage.
- AB 2514 also mandated the inclusion of storage technology considerations in each of the IOU's long-term Integrated Resource Planning (IRP).
- AB 2514 mandated that utilities cannot own more than 50 percent of the storage projects they propose
- According to AB 2514, an energy storage system must be "cost-effective and either reduce emissions of greenhouse gases; reduce demand for peak electrical generation; defer or substitute for an investment in generation, transmission, or distribution assets; or improve the reliable operation of the electrical transmission or distribution grid." In addition, the law requires the satisfaction of at least one of the following:
  - Use mechanical, chemical, or thermal processes to store energy that was generated at one time for use at a later time;
  - Store thermal energy for direct use for heating or cooling at a later time in a manner that avoids the need to use electricity at a later time;
  - Use mechanical, chemical, or thermal processes to store energy generated from renewable resources for use at a later time;
  - Use mechanical, chemical, or thermal processes to store energy generated from mechanical processes that would otherwise be wasted for delivery at a later time.
- Public utilities are required to purchase a targeted energy storage capacity equivalent to 1 percent of peak load by 2020. These are essentially voluntary storage targets that must be reviewed every three years.
- For investor-owned utilities the legislation requires the CPUC to set targets for the procurement of 'viable and cost-effective energy storage systems'. The IOUs received storage procurement targets based on their size. The IOUs are responsible for selecting and financing storage projects (as approved by the CPUC)
- AB2514, through which utilities are mandated to procure over 1.3GW of behind-the-meter storage by the early 2020s and the addition of energy storage into utilities' long-term Integrated Resource Planning (IRP).
- **[SB 350 \("The Clean Energy and Pollution Reduction Act"\) \(October 2015\)](#)**
  - SB 350 established the requirement that retail sellers and publicly owned utilities must procure 50 percent of their electricity from eligible renewable energy resources by 2030.

- SB 350 increased the state’s Renewable Portfolio Standard to 50 percent by 2030 and specifies storage as a means to help achieve the state’s goals.
  - The law established clean energy, clean air, and greenhouse gas (GHG) reduction goals, including reducing GHG to 40 percent below 1990 levels by 2030 and to 80 percent below 1990 levels by 2050.
  - SB 350 also requires the state to double statewide energy efficiency savings in electricity and natural gas end uses by 2030. To help meet these goals and reduce greenhouse gas (GHG) emissions, large utilities will be required to develop and submit integrated resource plans (IRPs). These plans detail how utilities will meet their customers’ resource needs, reduce GHG emissions, and ramp up the use of clean energy resources.
- **[AB 338 \(“Integrated Resource Plan; Peak Demand”\) \(2017\)](#)**
    - Signed in October 2017 by Gov. Jerry Brown, it required the California utilities to rely on energy efficiency, demand management, energy storage, and other strategies to meet peak electricity needs.
    - AB 338 requires the CPUC and the governing boards of local publicly owned electric utilities to consider, as a part of the integrated resource plan process, the role of distributed energy resources and other specified energy- and efficiency-related tools, in helping to ensure that each load-serving entity or local publicly owned electric utility, as applicable, meets energy needs and reliability needs while reducing the need for new electricity generation and new transmission in achieving the state’s energy goals at the least cost to ratepayers.
- **[AB 2868 \(“California’s Additional 500 MW Energy Storage Procurement Requirement”\) \(2016\)](#)**
    - Under AB 2868, California legislators added a new storage target that calls for 500 MW of behind-the-meter storage, or 166.6 MW for each IOU.
    - AB 2868 required PG&E, SCE, and SDG&E to propose programs and investments for up to 500 MW of distributed energy storage systems (defined as distribution-connected or behind-the-meter energy storage resources with a useful life of at least 10 years).
    - Transmission-connected storage resources are not included in the 500 MW target, to further emphasize the call for the development of distribution-connected storage resources.
    - The CPUC has emphasized that the 500 MW of storage required under AB 2868 in 2016 is separate from, and does not raise the targets set by, AB 2514. But in practice it will result in another 500 MW of storage being deployed by the three IOUs.

- [\*\*AB 33 \(“Energy Storage Systems; Long Duration Bulk Energy Storage Resources”\) \(2016\)\*\*](#)
  - Directed the CPUC to consider large-scale storage, specifically pumped hydro to "assess the potential costs and benefits of all types of long duration bulk energy storage resources, including impacts to the transmission and distribution systems of location-specific long duration bulk energy storage resources."
  - Required the CPUC to determine the role of large scale energy storage as part of the state’s overall strategy to procure a diverse portfolio of resources.
  - The law developed in response to the CA ISO’s call for fast-ramping, flexible resources to balance the grid and mitigate the potential impacts of over-generation from renewables.
  - Declared the legislature’s wish that the CPUC give particular consideration to long-duration storage for the grid, in recognition that to date storage installations have largely been dominated by lithium-ion batteries, which work better for short-term use.
  
- [\*\*AB 1637 \(“Energy: Greenhouse Gas Reductions”\) \(2016\)\*\*](#)
  - Authorized the CPUC to double the budget for the Self-Generation Incentive Program through 2019
  - This legislation reportedly added \$249 million to the funding that is available to small-scale distributed energy resources, including storage.
  
- [\*\*AB 2861 \(“Distribution Grid Interconnection Dispute Resolution Process”\) \(2016\)\*\*](#)
  - Authorized the CPUC to create an objective, expedited dispute-resolution process for distributed, behind-the-meter energy resources attempting to establish an interconnection to an IOU's electricity distribution network.
  - The resolution panel is to be staffed by electrical systems experts.
  - The responsibility of the panel is to evaluate a disputed interconnection fee, gathering input from both sides and ruling on the case within 60 days.
  - The law sets a goal of resolving disputes within 60 days, and would require the commission to appoint a "qualified electrical systems engineer with substantial interconnection expertise to advise the director of the energy division and to provide adequate commission staff to assist in resolving interconnection disputes."
  
- [\*\*AB 546 \(“Local Ordinances; Energy Systems”\) \(September 2017\)\*\*](#)
  - Requires all local governments to make available online all permitting applications for BTM advanced storage systems, and to accept such applications electronically. The law is meant to reduce the burden and costs on residential customers and prompt greater deployment of customer-sited energy storage systems.

- [\*\*SB 801 \(Aliso Canyon natural gas storage facility: electrical grid data: electricity demand reduction and response: energy storage solutions\) \(October 2017\).\*\*](#)
  - Requires the local publicly owned electric utility that provides electric service to 250,000 or more customers within the Los Angeles basin (i.e., LADWP) to do three things:
    - LADWP must share electrical grid data with any persons interested in the greater deployment of DERs;
    - LADWP must undertake load reduction measures by favoring demand response, renewable energy resources, and energy efficiency strategies over simply meeting demand with increased gas-fired generation; and
    - LADWP must determine the cost-effectiveness and feasibility of deploying 100 MW of energy storage in the Los Angeles Basin. SB 801 also requires any private utility serving the Los Angeles Basin (e.g., SCE) to deploy at least 20 MW of energy storage “to the extent that doing so is cost-effective and feasible and necessary to meet reliability requirements.”
  
- [\*\*SB 100 \(“California Renewables Portfolio Standard Program”\) \(2018\):\*\*](#)
  - Mandates 100 percent zero-emission electricity by 2045, with 60 percent renewables to be achieved by 2030.
  - Positions California as the largest U.S. state to set such an aggressive zero-emission electricity target
  - The law is viewed as an update to **SB 350**, which had established the requirement that retail sellers and publicly owned utilities must procure 50 percent of their electricity from eligible renewable energy resources by 2030.
  - SB 100 is not the first legislation requiring a reduction in overall greenhouse gas emissions; what makes this legislation different is that aims to eliminate greenhouse gas emissions entirely in the state.
  - This legislation positioned California as the second state to make a 100-percent clean energy commitment after Hawaii, which made that commitment in 2015.
  
- [\*\*SB 700 \(“Self Generation Incentive Program”\) \(2018\)\*\*](#)
  - Extends and continues to fund the state’s Self Generation Incentive Program (SGIP), extending rebates for customers who install behind-the-meter storage solutions through 2026.
  - Supplies roughly \$166 million per year in incentives for qualifying behind-the-meter technologies, or \$830 million total.
  - Available data indicates that the SGIP has contributed to about 318 MW of behind-the-meter energy storage procured in California.

- [\*\*SB 1369 \(Energy: Green Electrolytic Hydrogen\) \(2018\)\*\*](#)
  - Positions green electrolytic hydrogen, as defined, as one of these energy storage technologies to be targeted for increased use.
  - Requires the CPUC, State Air Resources Board, and the California Energy Commission to consider green electrolytic hydrogen an eligible form of energy storage, and to consider other potential uses of green electrolytic hydrogen

### **Pending Legislation**

- [\*\*AB 1144\*\*](#) (passed the Assembly on April 25, 2019; currently in Senate):
  - Would require the CPUC to allocate 10 percent of the annual collection for the self-generation incentive program in 2020 for community energy storage and other distributed energy resources for customers that provide critical infrastructure to communities in high fire threat districts to support resiliency during a de-energizing event.
- [\*\*AB 1503\*\*](#) (introduced in the Assembly April 12, 2019; currently in Senate):
  - Would require the CPUC beginning in 2022 to show how distributed energy and microgrids create jobs in its annual report to the Governor and Legislature on recommendations and plans for a smart grid.
- [\*\*SB 1347 \(introduced in the Senate; currently in the Assembly\)\*\*](#)
  - Would require the PUC, direct electrical corporations, community choice aggregators, electric service providers and certain electrical cooperatives to procure their proportionate share of a total of 2,000 MW of energy storage systems by Jan. 1, 2020.
  - Would authorize electric utilities to own and operate a certain percentage of those energy storage systems. The bill would require the CPUC to develop and make available to all load-serving entities a cost recovery mechanism for energy storage investments.
- [\*\*SB 772 \(introduced in the Senate in February 2019\)\*\*](#)
  - Would require the ISO to initiate a competitive solicitation process for 2-4 GW of long-duration bulk energy storage by June 30, 2022. To be eligible, a storage project must have at least 400 MW of capacity, an eight-hour minimum discharge capability, and a useful life of at least 40 years. The competitive solicitation process would provide for cost recovery from load-serving entities within the CA ISO territory. The real heft here might be the statement of intent: The legislature has declared its desire to see additional storage beyond what's already been called for, and if the utilities fail to carry out the task in good faith they could face repercussions.

## **REGULATIONS**

The CPUC regulates investor-owned electric and natural gas utilities operating in California. Among its many responsibilities, the CPUC oversees energy related functions such as determine electric costs; electric power procurement and generation; infrastructure; customer energy resources; energy efficiency; and electric rates and tariffs. Through its oversight over utilities, the CPUC has played a key role in developing the energy storage market in the state and issuing precedent-setting rules that other states have increasingly referred to as the presence of energy storage accelerates in various markets.

Here is a list of the most significant regulatory proceedings in California pertaining to energy storage that have transpired over the last decade, including key provisions:

### **R.10-12-007** (implementation of SB 2514) (opened in December 2010)

- SB 2514, signed into law in September 2010, required the CPUC to open a proceeding to determine appropriate utility procurement targets, if any, for energy storage systems that are commercially available and cost-effective. In response, the CPUC opened rulemaking R.10-12-007 on December 19, 2010.
- The high-level purpose of R.10-12-007 was to set policy for California utilities and load-serving entities (LSEs) to consider the procurement of viable and cost-effective energy storage systems and consider the appropriate utility procurement targets.
- R-10-12-007 consisted of several phases of workshops, modeling of energy systems, staff reports, proposed decisions, and stakeholder input.
- The process of establishing the procurement targets took the commission about three years. During this time, the CPUC held a series of workshops to evaluate cost and benefits of energy storage, use cases, modeling of energy systems, and procurement options.
- On October 17, 2013 meeting, the CPUC formally adopted a 1,325 MW procurement target for energy storage by 2020, with biannual targets increasing every two years from 2016-2020.
  - The targets were broken up by "use case buckets" (transmission-connected, distribution-connected, and behind-the-meter) and by each of California's three IOUs
  - The CPUC established an energy storage target of 1,325 MW for PG&E, Edison, and SDG&E by 2020, with installations required no later than the end of 2024.
  - According to the CPUC the reasons for the energy storage mandate:
    - Increase energy storage at the grid level will optimize the grid, including peak reduction, contribution to reliability needs, or deferment of transmission and distribution upgrade investments

- Integrate renewable energy
    - Reduction of greenhouse gas emissions to 80 percent below 1990 levels by 2050, per California’s goals
  - The CPUC also reinforced important characteristics of the targets:
    - The targets were defined in power capacity (MW) without defining any specific technology, ramp-up time, amount of energy (MWh), or expected duration.
    - The legislation from which the targets were mandated aimed to stimulate new types of energy storage such as compressed air energy storage (CAES), battery-based energy storage, thermal energy storage, fuel cells and other technologies.
    - Large pumped hydro storage was not included.
    - The mandate specified that utilities cannot own more than 50 percent of the storage projects they propose.
  - To foster emerging technologies (such as thermal or flywheel storage), smaller scale projects and disruptive suppliers, hydroelectric storage projects larger than 50 MW are not eligible under the CPUC’s mandate.
- In this rulemaking, the CPUC determined that appropriate interconnection policies are one of the major barriers toward the deployment of storage.

**D.13-10-040 (October 2013)**

- The decision established:
  - Storage targets for each of the investor-owned utilities and Electric Service Providers (ESPs)/Community Choice Aggregators
  - Mechanisms to procure storage and means to adjust targets for storage procurements in various grid domains (Transmission, Distribution and Customer-sited); and
  - Program evaluation criteria.
- D.13-10-040 set procurement targets for 2014 to 2020, adopted the Energy Storage Procurement Framework and Design Program, and directed the state’s three IOUs to file four biennial storage procurement applications starting in March 2014.
- D.10-13-040 required IOUs to provide proposed procurement details, including Power Purchase Agreements (PPAs), bid evaluation protocols, request for cost-recovery authorizations, and to report on storage procurement to date.
- D.13-10-040 also directed that a comprehensive evaluation of the Energy Storage Framework and Design Program be conducted no later than 2016 and once every three years thereafter.
- With the issuance of this Decision, R.10-12-007 was closed.

#### [D.14-10-045](#)

In this decision, the CPUC:

- Evaluated and approved the utilities' energy storage procurement plans for the 2014 biennial period, with some modifications.
- Approved eligible energy storage technologies and approved the Power Charge Indifference Adjustment (PCIA) mechanism to allow recovery of potential above-market costs associated with departing load for market/"bundled" energy storage projects.
- In compliance with Decision D.13-10-040, this decision approved the three IOUs' Energy Storage Framework and Program Applications for the 2014-2016 Biennial Procurement Period with some important modifications as follows:
  - Approved proposed energy storage procurement proposals of SDG&E (16 MW), SCE (16.3 MW), and modified the storage proposal of PG&E to 80.5 MW;
  - Clarified "eligible" technologies *including* V2G electric vehicle technologies, eligible storage component of biogas, eligible storage component of solar thermal (CSP-TES), eligible storage component of hybrid thermal generation (Hybrid-TES), but *excluding* V1G and biogas (without eligible storage component);
  - Denied request for extension of the PCIA mechanism for market/"bundled" energy storage contracts beyond 10 years;
  - Directed SCE and PG&E to provide a more detailed explanation of the type of storage resources and the associated MW quantities the IOU intends to procure, categorized by grid domains, use cases, and locations.

#### [R.15-03-011](#) (implementation of AB 2868) (opened in March 2015)

- This proceeding, opened as a result of AB 2514, was intended to refine and evaluate California's energy storage framework and policies. The proceeding was broken into two tracks.
  - Track One (now complete) focused on issues that would impact 2016 procurement such as new technologies, flexibility between grid domains, and cost recovery.
  - Track Two focused on refining the CPUC's storage framework and policy.
- A key component of this rulemaking was that the CPUC approved rules for energy storage resources that can provide multiple services in January 2018.
- The CPUC reasoned that since contemporary market rules fail to compensate energy storage resources for all of the values that they could provide to the grid, utilities must account for those uncompensated values in their planning to ensure that the full economic value of energy storage is reflected in resource decisions.

- Prior CPUC rules did not allow an energy resource to “stack” more than one service, which mean that a resource could not be paid for the incremental values it brought to the wholesale market, distribution grid, transmission system, resource adequacy, or end-use customers.
- Under the rulemaking, energy storage resources can now provide services to either the domain in which they are interconnected or “higher” domains (but not “lower” domains). For example, an energy storage resource interconnected at the distribution level could also provide services at the higher transmission, wholesale market, and resource adequacy levels, but not at the lower customer level. The rules prioritize reliability services over non-reliability services and seek to ensure that multiple reliability service obligations do not conflict with one another. The rules also aim to enhance transparency and avoid double compensation.
- Recognizing the unique operating characteristics of energy storage (e.g., it can serve as both load or supply), the CPUC adopted 11 rules outlining how multiple use applications (MUAs) should be evaluated, enabling the resources to stack incremental value and revenue streams through the delivery of multiple services.
- The CPUC’s 11 rules pertaining to MUAs for storage are:
  1. Resources interconnected in the customer domain may provide services in any domain.
  2. Resources interconnected in the distribution domain may provide services in all domains except the customer domain, with the possible exception of community storage resources.
  3. Resources interconnected in the transmission domain may provide services in all domains except the customer or distribution domains.
  4. Resources interconnected in any grid domain may provide resource adequacy, transmission and wholesale market services.
  5. If one of the services provided by a storage resource is a reliability service, then that service must have priority.
  6. Priority means that a single storage resource must not enter into two or more reliability service obligation(s) such that the performance of one obligation renders the resource from being unable to perform the other obligation(s). New agreements for such obligations, including contracts and tariffs, must specify terms to ensure resource availability, which may include, but should not be limited to, financial penalties.
  7. If using different portions of capacity to perform services, storage providers must clearly demonstrate, when contracting for services, the total capacity of the resource, with a guarantee that a certain, distinct capacity be dedicated and available to the capacity-differentiated reliability services.

8. For each service, the program rules, contract or tariff relevant to the domain in which the service is provided, must specify enforcement of these rules, including any penalties for non-performance.
  9. In response to a utility request for offer, the storage provider is required to list any additional services it currently provides outside of the solicitation. In the event that a storage resource is enlisted to provide additional services at a later date, the storage provider is required to provide an updated list of all services provided by that resource to the entities that receive service from that resource. The intent of this Rule is to provide transparency in the energy storage market.
  10. For all services, the storage resource must comply with availability and performance requirements specified in its contract with the relevant authority.
  11. In paying for performance of services, compensation and credit may only be permitted for those services which are incremental and distinct. Services provided must be measurable, and the same service only counted and compensated once to avoid double compensation.
- Also in this rulemaking, the CPUC ordered the IOUs to incorporate proposals for programs and investments for the full 500 MW of distributed energy storage systems (166.66 MW for each of PG&E, SCE, and SDG&E)
  - This proceeding was a successor of R. 10-12-007

**D.19-01-03: (2018)**

- Allows customers with energy storage systems to receive credits for storage energy that is sent back to the grid, as long as the storage system charges entirely from solar.
- In the past, customers were only allowed to receive credits from the excess energy produced by a solar system exported to the grid, but now, with some stipulations, energy exports from a battery with receive full NEM credit.

**D.14-05-033 (2019)**

- On January 31, 2019, the CPUC issued a final decision granting a petition to modify Decision 14-05-033, which governs net metering in California.
- The modification allows certain DC-coupled energy storage systems that adopt UL-verified firmware to benefit from net energy metering (NEM).
- In practice, this means that going forward in California, solar-plus-storage asset owners can export battery power onto the grid and receive NEM credits on all solar and storage exports, including those with aggregate (NEM-A) and virtual (NEM-V) tariffs.
- Before the January 2019 decision, DC-coupled solar-plus-storage projects installed behind-the-meter could not be interconnected under NEM, out of a concern formally

expressed by the state's utilities that solar-plus-storage owners would charge their batteries from the electric grid at an inexpensive nighttime rate and later profit by selling the stored grid power back to the utility at higher NEM daytime rates.

Other relevant regulatory proceedings pertaining to energy storage policy that have been conducted at the CPUC include:

- **D.17-04-017**: Approved 85 percent of funds authorized by AB 1637 (another \$196 million) to be made available in the Self-Generation Incentive Program (SGIP) for commercial, industrial, and residential behind-the-meter energy storage systems.
- **D.16-06-055**: Approved a 75 percent budget allocation for storage in the Self-Generation Incentive Program, along with other reforms including changes to support long-duration storage.
- **D.16-06-052**: Improved treatment of behind-the-meter energy storage load in Rule 21 and an expedited review process for standardized non-export storage
- **D.12-08-016**: Adopted proposed targets and framework for analyzing energy storage needs pursuant to AB 2514
- **D.11-09-015**: Modified SGIP eligibility to include energy storage technologies

#### **Revisions to Rule 21**

Another regulatory initiative in California that had direct implications for energy storage were the changes that the CPUC made to Rule 21, the tariff that describes the interconnection, operating and metering requirements for certain generating and storage facilities seeking to connect to the electric distribution<sup>1</sup> system.

For background, Rule 21 describes the interconnection, operating and metering requirements for generation facilities to be connected to a utility's distribution system, over which the CPUC has jurisdiction. This jurisdiction includes the interconnection of all net energy metering (NEM) facilities, "Non-Export"<sup>2</sup> facilities, and qualifying facilities intending to sell power at avoided cost to the host utility. Rule 21 does not apply to the interconnection of generating or storage facilities intending to participate in wholesale markets overseen by the Federal Energy Regulatory Commission (FERC). Each of California's large investor owned utilities (IOUs) has its own Rule 21 tariff as part of its electric rules; however, they are largely equal in content.

Rule 21 contains provisions governing many aspects of interconnection, including:

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- Procedures and timeframes for reviewing applications
- Fee schedules to process applications and perform impact studies
- Pro forma application and agreement forms
- Allocation of interconnection costs
- Provisions specific to net energy metered facilities
- Technical operating parameters
- Certification and testing criteria
- Technical requirements for inverters
- Metering and monitoring requirements
- Procedures for dispute resolution