California's Changing Energy Market Must Include Flexibility to Sustain Growth

Clean energy in California has become carbon-free energy. Energy and climate change policy are so entwined it is unclear where clean energy and climate policies begin and end. To meet our 2030 greenhouse gas emission reduction mandates, drastic changes will need to be made across all sectors. As policies shift away from fossil resources, new demand on the renewable electric sector is created.

Given these mandates, the production, transmission and cost of energy continue to be an issue for California residents, the business community and overall economy. In pursuit of the state's carbon and clean energy goals, cost impacts to end use customers are real. For California to remain competitive, leaders should adopt policies to minimize costs while upgrading and expanding the energy system to electricity customers in order to meet the state's environmental goals. Reliability and affordability need to be at the forefront of California's evolving energy market.

Renewable Energy Expansion and Implementation

California has one of the most ambitious renewable energy mandates in the country in addition to one of the most ambitious greenhouse gas reduction mandates (see the *Issues Guide* article on Climate Change). With the passage of SB 350 (de León; D-Los Angeles; Chapter 547, Statutes of 2015), California increased the Renewable Portfolio Standard (RPS) to 50%, allowed for the creation of a regional energy market, and doubled the energy savings in existing buildings. Although the implementation of this legislation is in its infancy, there is movement on the components, and they all carry significant changes for California's energy system.

The RPS is a regulation that mandates a utility company to procure a specified amount of its energy generation from eligible renewable resources. In California, those resources include: small hydro, solar, wind, biomass, biogas, fuel cells, geothermal and some tidal technologies. The first RPS was signed into law in 2002, requiring utilities to procure 20% of their electricity from eligible renewable energy resources by 2010. In 2011, the RPS was increased to 33% by 2020, and in 2015, the RPS was increased to require utilities to procure at least 50% of their electricity from eligible renewable resources by 2030.

With the passage of a 50% RPS, the current program was modified to ease compliance for utilities beginning in 2021. The changes in 2015:

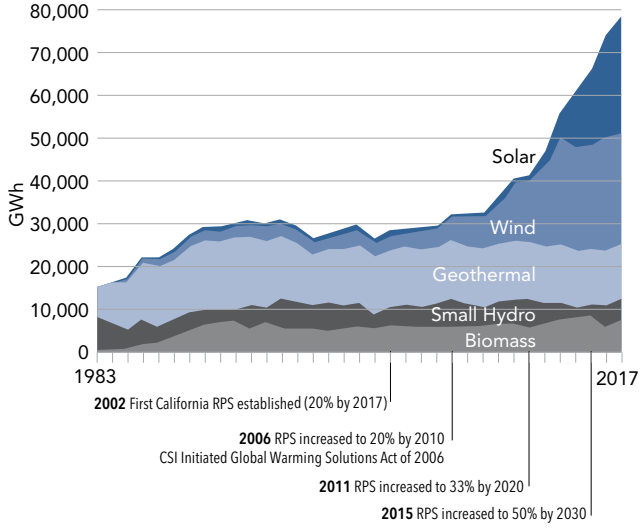
- Require utilities to procure at least 65% of their contracts for 10 years or longer, allowing 35% of contracts to be short term, permitting more flexibility in contracting for utilities; and
- Allow for banking of specified renewable resources, which will permit a utility to procure excess power to keep and apply toward a future compliance period.

Currently, 29% of energy in the state comes from renewable resources eligible under the RPS and utilities are on target to exceed the 2020 RPS mandate. Given the new 50% RPS mandate and other energy policies that are being implemented simultaneously, however, there are concerns about the price and intermittency of the electricity being purchased.

In 2017, SB 100 (de León; D-Los Angeles) was introduced, calling for the RPS to increase to 60% by 2030 and 100% zero-carbon electricity by 2045. Although this seems like a far-fetched goal to many, the conversation is one in which California is at the forefront. Other states and nations are looking to California as a leader on a zero-carbon energy future and considering pledges or goals that are nearly as aggressive. Although SB 100 did not pass the Assembly, it is anticipated that this legislation will remain a topic for discussion in 2018.

California Renewable Energy Generation by Resource Type (In-State and Out-of-State)*

*Does not include behind-the-meter generation.



Source: California Energy Commission, Tracking Progress (Updated November 2017).

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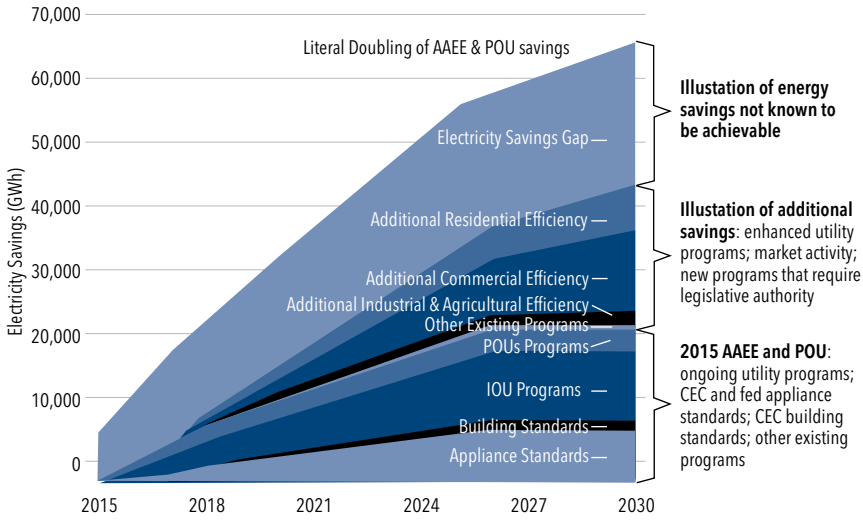
Existing Building Energy Efficiency

SB 350 set a goal of doubling the energy savings—both electricity and natural gas—in existing buildings. A significant amount of carbon emission comes from powering buildings and homes, and this is one of the more difficult goals to achieve. There will have to be coordination among agencies and incentives for upgrades to allow building owners to make cost-effective changes to their energy usage. To ensure that energy efficiency savings are being made and are cost-effective, the California Public Utilities Commission (CPUC) is required to conduct a comprehensive review of the feasibility, costs, barriers and benefits to achieving the energy savings.

To complement the provisions of SB 350, AB 802 (Williams; D Santa Barbara, Chapter 590, Statutes of 2015) was enacted to help building owners achieve energy efficiency goals. AB 802 has two components: benchmarking energy data and re-examining utility energy efficiency incentives. Before the passage of AB 802, electrical and gas corporations were allowed only to offer energy efficiency incentives for measures that improved buildings beyond existing efficiency codes and standards. The CPUC will now be required to authorize incentives for energy efficiency upgrades for projects that would improve a building's efficiency beyond its current condition. This will allow incentive programs to reach more buildings, lower costs and improve efficiency throughout the state.

Illustration of Current, Enhanced and Unknown Sources of Savings to Achieve the 2030 Electricity Target



IOU: Investor-Owned Utilities
AAEE: Additional Achievable Energy Efficiency
POU: Publicly Owned Utilities
CEC: California Energy Commission

Source: California Energy Commission Staff (January 2017).

Distributed Generation

Another tool intended to help California meet its clean energy goal is distributed generation. Distributed generation is electricity, usually renewable, produced on-site or near where electricity is consumed. Projects are limited to 20 megawatts (MW). Solar energy makes up the largest percentage of the distributed generation online, but other sources include biomass, small hydro, wind and geothermal.

Governor Edmund G. Brown Jr. set a goal for California to receive 12,000 MW (about 5%–8% of current consumption) of its electricity from distributed generation by 2020. California has made progress toward achieving the Governor's 12,000 MW renewable distributed generation goal, and more than 10,400 MW of distributed generation was online as of June 2017. Incentives often are provided to encourage utility customers to participate in distributed generation. The incentives include rate subsidies or programs that benefit customers participating in the program, but will come at a cost to all utility customers.

Energy Storage

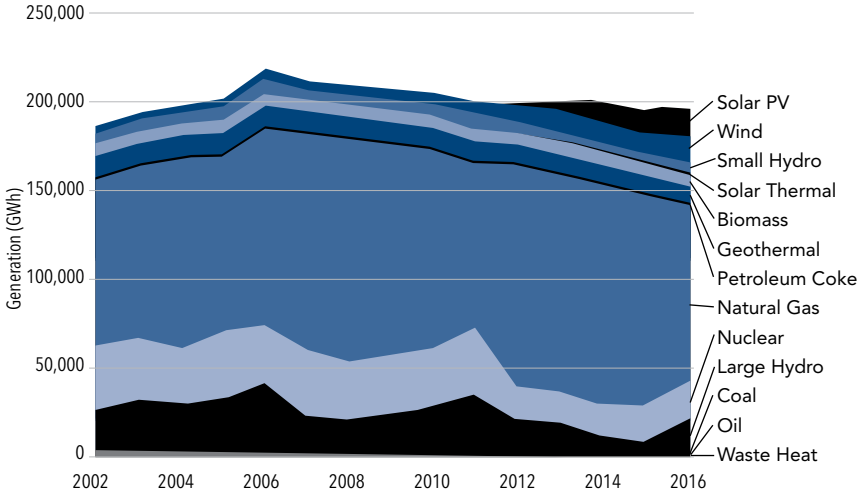
Although renewable energy presents a great alternative to traditional energy sources, it comes with limitations. Because the amount of renewable energy available depends greatly on the climate (solar, wind, water), the state's energy providers need to be able to store energy so that it is available when needed. AB 2514 (Skinner; D-Berkeley, Chapter 469, Statutes of 2010) directed the CPUC to require utilities to procure energy storage systems. The legislation instructed the CPUC to open a proceeding by March 1, 2012 to consider adopting these requirements. The CPUC issued the final rule on September 3, 2013, requiring investor-owned utilities to purchase 1,325 MW worth of energy storage projects by 2020.

In 2016, the Legislature passed AB 2868 (Gatto; D-Glendale, Chapter 681), which requires the three largest investor-owned utilities to file applications for programs and investments to accelerate widespread deployment of distributed energy storage systems with the CPUC for its review and approval.

Although there have been some promising advances, energy storage technology is in its early stages and still is expensive. Prices are expected to fall over the next 15 years as technology advances, but utilities will be required to make investments before 2020. California's energy experts agree that in order to maintain grid reliability, the state must have a generation mix with complementary resources, as well as storage systems in place to ensure the lights stay on.

With increased demand on energy storage, there are issues that need to be addressed moving forward:

In-State Electric Generation by Fuel Type



Source: California Energy Commission

• Assurance that storage systems can provide multiple services from the same system, while also ensuing the ratepayer is not paying additionally for the same service;

• End-of-life battery recycling; and

• Developing standardized testing to ensure that batteries can meet the expected lifetime.

Smart Grid Technology

Smart grid technology modernizes the electric grid by using a distribution system that allows for two-way information flow from a customer's meter: both inside the house/building to thermostats, appliances and other devices, and from the house/building back to the utility. A smart grid can include a variety of operational and energy measures, such as smart meters, smart appliances, renewable energy resources, energy efficiency resources, demand response measures, and energy storage.

Because the existing grid is increasingly costly to maintain and will not be able to meet the demands placed on it in the future, smart grid technology is a reliable, efficient, affordable and interoperable system that, according to the CPUC, is a better fit for integrating and accommodating renewable technology.

Although there will be an upfront investment, it is believed that end-use customers will benefit by having more information and tools to manage their electricity usage and thereby the ability to educate themselves on ways they can conserve or alter their energy consumption to save on utility bills.

Transportation Electrification

California has set ambitious targets toward an electrified transportation system to improve air quality and reduce greenhouse gas emissions. Governor Brown issued Executive Order B-16-12, which set the goal of 1.5 million zero-emission vehicles (ZEVs) on the road by 2025. Subsequently there has been legislation to codify the goal of 1 million ZEVs on the road by 2023 (de León; D-Los Angeles; Chapter 530, Statutes of 2014). California is already home to more than half the ZEVs in the United States, but there is a push from regulatory agencies to develop policies to make ZEVs clear winners for transportation to aid the state in achieving its environmental goals.

It is important to recognize that electric vehicles are not the only ZEVs, which also include light-duty fuel-cell, all-battery and plug-in electric hybrid vehicles. Currently, most ZEVs on the road are electric. This creates an interesting intersection with the electric sector and the load growth needed to support the charging of electric vehicles. The changing energy landscape will need to accommodate this growth, with clean energy sources, to achieve state goals. Greater use of electric vehicles will change the way that energy is consumed and stored, and at what time of the day it is consumed. Currently, the largest portion of renewable energy is available during the middle of the day. Although scenarios still are being considered on how to integrate electric vehicles onto the grid, their increased use will be an important consideration for policy making moving forward.

Natural Gas

Natural gas plays a vital role in California's energy sector as a flexible energy source. California ranks the second highest in the United States in natural gas consumption. In addition to helping integrate intermittent renewable electricity and generating electricity, natural gas also is used for cooking, space and water heating, as well as transportation.

Natural gas-fired power plants can be ramped up quickly to produce energy to help maintain grid stability while integrating the intermittent renewables. Although natural gas is a vital resource in the state, there is a push to move away from natural gas to reduce greenhouse gas emissions in pursuit of zero-carbon energy. This trend has resulted in some natural gas plants going offline or not being relicensed or granted permits because they are being used less and less and are no longer profitable. It is important to maintain a fleet of natural gas power plants to have a flexible energy source to integrate renewables. Regulatory agencies will need to work together to ensure the state retains the necessary resources to maintain reliability.

Natural gas also is considered a renewable resource when produced from anaerobic digestion, recovered methane from livestock operations, or wastewater treatment and landfills. This technology currently is available in some locations, but not without cost implications. Renewable natural gas is seen most often in the context of transportation where vehicles are powered by renewable natural gas rather than fossil natural gas.

There have been legislative attempts to adopt a renewable

gas standard to reduce carbon emissions, modeled after the RPS for electricity. Past proposals have included a percentage reduction in the carbon intensity of the natural gas in the system. It is likely that these proposals will continue and become more aggressive as the state pushes toward carbon emission reductions from the energy sector.

Customer Choice

Not only are state views of the energy sector evolving; the way people are purchasing energy also is changing. Investor-owned utilities traditionally have served three-quarters of the state's energy customers, with the publicly owned utilities serving much of the rest. There are many more options for customers than there once were, however. Through state mandates and incentives, solar panels on millions of homes and buildings provide them with self-generated energy. Other businesses are contracting for their own renewable energy. Local governments also are joining together to form community choice aggregators (CCAs). CCAs can buy electricity on behalf of their customers, with limited oversight from the CPUC, therefore keeping costs down for customers. These other options are a threat to the investor-owned utilities, whose customer base is anticipated to drop by 85% over the next 10 years.

The decline in the customer base is changing the way that the investor-owned utilities are entering into contracts. Currently, the investor-owned utilities are not entering into long-term contracts because of the unknown future customer base. They do not want to be left with contracts to fulfill if they do not have the customers to buy that electricity. At the same time, CCAs often do not have the capital to make the investments in these contracts. This creates a lot of uncertainty as to what role each of these players will take in California's energy future. CCAs will continue to be a topic of legislation as the power structure in the state evolves.

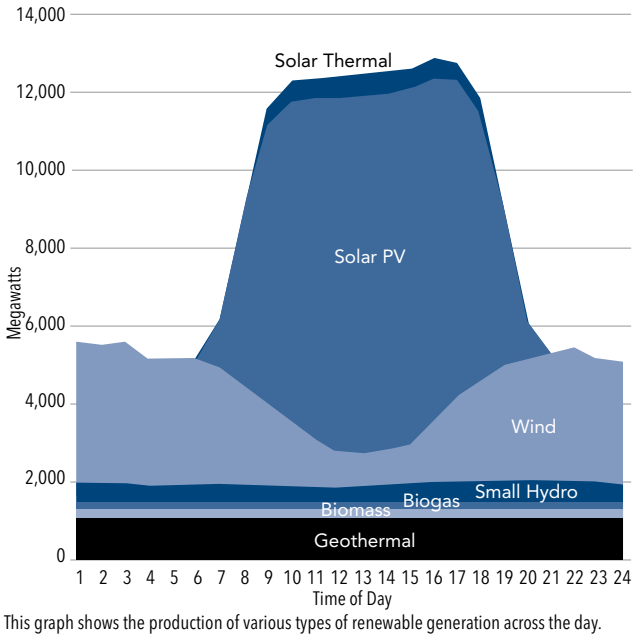
Transmission Needs

Transmission needs are evolving just as the energy system is. Any new development of large-scale renewable energy will require transmission to move that energy from where it is produced to where it is used. Financing transmission projects relies on a developer's ability to justify the cost and satisfy state and federal cost recovery regulations. Moreover, developers must satisfy both state and federal environmental regulations. Developers must seek approval from at least three state agencies and several federal agencies, depending on the location of the project. Assuming agency approval is forthcoming, developers still must overcome opposition from various interest groups, which often takes the form of legal challenges. Given the rigors of the approval process, transmission upgrades and construction can take anywhere from 5 to 20 years to complete.

In March 2017, the California Energy Commission (CEC), CPUC and the California Independent System Operator (CAISO) reported the results from the Renewable Energy Transmission Initiative (RETI) 2.0 to help identify the transmission projects needed for the state to meet its current energy policy goals for a 50% RPS. The RETI, intended to inform future transmission planning cycles, found that numerous new transmission lines and upgrades to existing transmission lines throughout the state need to be made to meet growing demand for electricity and to provide renewable sources of energy. Detailed information from the final plenary report can be found at *energy.ca.gov/reti/*.

The most recent 2016–2017 Transmission Plan released by the CAISO identified a need for two transmission projects with an estimated $24 million price tag to maintain system reliability within the CAISO territory.

Hourly Average Breakdown of Renewable Resources



This graph shows the production of various types of renewable generation across the day.

Source: California ISO Daily Renewables watch (July 1, 2017).

Regional Energy Market

A regional energy market has the potential to reduce energy costs in all participating states by integrating a diverse portfolio of resources on one coordinated grid. SB 350 included intent language to transform the CAISO into a regional organization, upon the approval of the Legislature. The CAISO must prepare specified governance modifications, conduct studies on the impacts of a regional market, the environmental and economic impacts of a regional grid, and receive approval from the Legislature to move forward.

A regional energy market also increases the reliability of power delivery as energy losses can be devastating to businesses. A regional grid would increase reliability by providing operators with a better system that integrates diverse sources of renewable energy throughout the Western Region. For example, when there is excess generation of energy from solar power within the

state and demand is low, that energy can be exported cheaply to other states. Likewise, when an abundance of wind generation in the Pacific Northwest creates a surplus, that energy can be imported to meet demand in California.

While the efforts to reform the CAISO into a Regional Energy Market have continued, the CAISO also has grown the Energy Imbalance Market (EIM) that it started in 2014. The EIM is a voluntary program that allows system operators to conduct real-time grid coordination so the CAISO market systems can identify changes in supply and demand and move power over a broad area, reducing system costs. At the outset, the EIM included coordination between the CAISO and PacifiCorp, but has expanded to include NV Energy (northern and southern Nevada), Arizona Public Service, Puget Sound Energy and Portland General Electric, with more participants pending.

Although regionalization has been controversial in policy discussions, there is an interest for this effort to move forward to help with the state's environmental policies. Legislation introduced in 2017 would have allowed for expanding a regional grid and while neither of the two bills progressed, there could be movement in 2017.

In December 2017, other regional grid management systems announced they will explore partnerships in the West. These partnerships could be competition for the CAISO to expand. If these discussions progress, they could pull away other grid operators that would have had an interest in joining the CAISO.

CalChamber Position

As California pursues its clean energy goals, the driving force for the state's energy policies needs to be maintaining a reliable, efficient and affordable energy system. It is critical that California's electricity generation keep pace with its growing population and increased and changing demand.

Flexible resources to sustain future economic growth and to ensure renewables are able to come online in time to keep up with the various programs being implemented across agencies need to remain a focus. To meet the changing grid demands, maintaining and expanding the state's energy infrastructure is vital. Continued research and development is needed in technologies that help advance energy efficiency goals, reduce costs and increase grid reliability.

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