

Smart California Cities: State's Changes Driving Smart Energy Solutions

By Neil Alexander

There are multiple components to Smart Cities; including smart energy, smart water, smart transport, smart buildings and smart government. While specific California initiatives focus on each component, recent changes around smart energy and buildings are driving increased opportunities in these areas for those "smart" enough to see.

Distributed energy resources (DERs) represent one of these opportunities. DERs are utility or customer-sited resources on the distribution grid that can include combined heat and power, solar photovoltaic, wind, battery storage, thermal storage, and traditional demand-response technologies.

Three factors are currently paving the way for increased consideration and adoption of DERs to energize the Smart City drive:

1. Time-of-use (TOU) changes affecting investor-owned utilities (IOUs) to account for renewable generation,
2. Increased accessibility of Community Choice Aggregation/Energy (CCA) programs making procurement of these renewable resources possible, and
3. Opening of competitive energy supply markets to assets providing greater than 100kW of load by the Federal Energy Regulatory Commission (FERC)

These factors are making the financials for the installation, operation, and optimization of distributed resources more feasible while creating new revenue streams and local jobs.

New Time-of-Use Rates

California IOUs are decoupled regulated utilities that provide transmission and distribution services for local energy grids. These IOUs pass the cost of energy through to their customers.

California IOUs include: Southern California Edison (SCE®); Pacific Gas & Electric (PG&E®); and Sempra® Utilities, which is made up of Southern California Gas Company (SCG®) and San Diego Gas & Electric (SDG&E®). As renewable resources such as wind and solar have penetrated the market, utilities have had to pay more to provide the energy customers consume and to ensure that enough power is always available to meet demand. The utilities receive payment for providing these services through their electricity tariffs (rates) which are approved by the regulating body, the California Public Utilities Commission (CPUC).

Because the current electricity rates do not align with the actual costs of procuring the assets required to provide electricity to California, the utilities have requested rate updates to reflect their actual costs. Essentially these rate changes have shifted

the time of the most expensive rate period. Previously most costly from 12-6 pm, electricity use is now most expensive from 4-7 pm. This shift reduces the financial benefit of solar generation *unless* a solar site was grandfathered into the old rates prior to 2017 year-end *or* an energy storage system allows a shift of energy use to the new time frames.

Especially given these rate changes, a **flexible DER**, can prove economically attractive now and for the future. A flexible DER combines a new solar installation with renewable energy storage. The flexibility provided by the storage of renewably created energy means that the asset can operate more like a typical energy asset and less like an uncontrolled volatile resource affecting the California energy grid.

A flexible DER also can meet the criteria for the government's Self-Generation Incentive Program (SGIP), making DERs even more beneficial. These incentives, which can provide a significant reduction in energy storage costs, are only available for renewable generation mixed with energy storage (or for energy storage alone).

Community Choice

While DERs address energy consumption and TOU issues (essentially consumer-side challenges), Community Choice aggregation programs in California provide more *choice* for consumers when it comes to how power is generated. These aggregation programs also provide a unique option for a local CCA to procure local DERs that are installed by customers.

A CCA is a government entity (typically a group of aligned local municipalities) that purchases electricity in the wholesale market for its residents and businesses.

The CCA makes agreements with energy providers for the specific needs of their local customers *typically* resulting in lower energy costs to all involved. The customers are still provided

transmission and distribution services by their local IOU, but the **generation** is determined by the CCA.

CCAs represent a relatively recent phenomena. Authorized in 2002 with AB117, they became a reality in 2011 when SB790 passed. Marin Clean Energy (now MCE) became operational in 2010 and many Bay-area communities followed. To date, there are 13 California CCAs either operational or scheduled to soon become operational.

These CCAs can procure both renewable energy contracts and regular carbon energy contracts, and then provide options to residential and commercial customers to procure power either cheaper or greener.



CCA Utility Grid Structure



For example, MCE provides customers with three energy program options. According to MCE:

- The Light Green option costs 2-5 percent less than typical PG&E rates
- Deep Green is more expensive but features the option to buy power that is renewable or even local should the customer prefer that.
- Local Sol takes the local option further, providing the renewable options that Deep Green offers but allowing customers to procure only local solar power generated specifically in the community.

CCAs represent considerable progress in the drive towards Smart Cities because local DERs will be able to be procured locally. This means that local DERs, especially with flexibility, will be able to enter into agreements with local CCAs, reducing the overall costs of getting the power to local distribution grids, improving the CCAs’ ability to procure renewable assets, and reducing the energy costs of the consumers in turn. All the while, building and operating the local DERs will create local jobs for the communities where they are creating and buying power and creating a new revenue source for the DER provider.

Distributed Energy Resources: a Revenue Source

A DER can do even more than provide local, renewable power that serves as contracted revenue source. The DER asset now serves as a flexible supply that helps operate and manage the complex California energy grid.

The California Independent System Operator (CAISO) manages the California energy grid to ensure grid stability through competitive energy markets. Grid stability means consistently matching electricity supply with demand at specific locations needed, while maintaining the 60 Hz frequency used in North America. It is very, very complex and has unique markets for customers to offer in load and grid services.

These services include markets in the day-ahead and 15-minute time frames with offerings for capacity, frequency, and ancillary services. Without delving into the complexities of market products, it is important to note that these market products are worth a lot of money when offered into the energy markets and delivered as offered.

Earlier this year, the Federal Energy Regulatory Commission ruled that that energy storage assets are on the same footing as normal generating assets within the energy markets **and** reduced the minimum allowable size of such an asset to 100 kW. This major change means that assets with the ability to provide 100 kW or more are to be *compensated* the same as normal grid assets. This modification enables a potential new revenue stream for assets with storage that can provide grid services to the local independent system operator. In many cases this revenue well outbalances the savings from offsetting energy use based on straight electricity rates.

Granted, there are significant steps between owning a DER asset and being able to offer services to CAISO; a registered scheduling coordinator is required to offer bids on customers’ behalf, the assets values need to be continually monetized and state of charge or generation consistently monitored in order to optimize the value of the DER, but the possibility offers tantalizing financial opportunities.

How to Grasp the Opportunities

The three changes driving California cities towards DERs as an interesting energy solution with a strong financial case are present on multiple aspects of the energy supply chain. These challenges include modified utility rates driving the need for energy storage, the local CCAs creating a need for local assets and the CAISO opportunity being opened by the FERC ruling with an overall need to balance the grid due to heavily increased intermittent renewable production. The challenges create opportunities for financial gain that also deliver efficiency, resiliency, and flexibility.

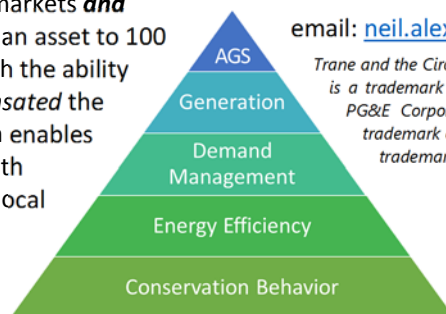
To fully grasp these opportunities requires the ability to fully understand today’s challenges as well as tomorrow’s opportunities and plan accordingly – or the opportunity to partner with a team who does. Trane, for example, works with customers to understand current demand needs and assets, reviews local energy supply opportunities and helps design solutions to optimize the system as a whole. From design to installation, the Trane team can ensure that the right assets are combined in a system that is designed to maximize goals, whether they be increased revenue, increased resiliency, or a combination in between. Trane offers deep and wide expertise within one organization, creating a one-stop shop. Trane is an energy services company (ESCO) that provides unique design-build solutions, while its energy supply services consulting group provides a scheduling coordinator. Additionally, its world-renowned controls group provides Advanced Grid Services solutions to analyze and optimize DER solutions to match established goals.

The opportunities for establishing a foundation for Smart Cities have arrived; those that establish a plan and start today will be strongly positioned for continual success tomorrow and beyond.

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Trane’s Energy Prioritization Pyramid