

# CLOSING THE CALIFORNIA CLEAN ENERGY DIVIDE

## Reducing Electric Bills in Affordable Multifamily Rental Housing with Solar+Storage

May 2016

### SUMMARY OF FINDINGS

Battery storage is emerging as an effective new strategy for reducing electricity costs for affordable multifamily rental housing in California. Battery storage systems not only provide economic returns today, they can also preserve the value of solar in an evolving policy and regulatory environment. Because batteries empower owners of solar photovoltaics (PV) systems to take control of the energy they produce and when they consume it, storage can deliver deeper cost reductions that can be shared among affordable housing owners, developers, and tenants.

California has installed numerous integrated solar and battery storage projects; however, few have served low-income tenants or owners of affordable rental housing. This disparity is due to many factors, including a lack of information about the economics of these systems in multifamily housing. To provide that needed information, Clean Energy Group, California Housing Partnership, and Center for Sustainable Energy, with analytical support from Geli, are embarking on a series of reports on solar and storage in California affordable multifamily rental housing.

The first report in this series, *Closing the California Clean Energy Divide: Reducing Electric Bills in Affordable Multifamily Rental Housing with Solar+Storage*, examines the utility bill impacts of adding battery storage to stand-alone solar in affordable rental housing facilities in California's three investor-owned utility service territories, each with different rate structures. It is the first such report on these technologies in this sector in California. The findings detailed in this summary are excerpts from the full report, which can be downloaded at [www.resilient-power.org](http://www.resilient-power.org)



# Economic Analysis Findings

The economic analyses modeled for this research effort support several key findings about the financial benefits of installing solar + storage in affordable multifamily rental housing in California.

### FINDING NO. 1

**Adding battery storage to an affordable rental housing solar installation in California can eliminate demand charges for building electricity loads, resulting in a net electricity bill of essentially zero.**

A solar system designed to offset 100 percent of a building's electricity consumption through net energy metering (NEM) can reduce the energy usage charges on a property owner's utility bill to zero, but energy consumption charges often amount to about half of the total bill. For buildings that incur demand charges, which are based on the highest demand for power at any point over a billing period, the other half of the bill remains largely intact. Adding solar may result in a modest reduction in demand charge costs, but these savings are not guaranteed, as one cloudy day can erase savings for an entire period, and solar can do nothing to reduce peak demand occurring in early morning or evening hours.

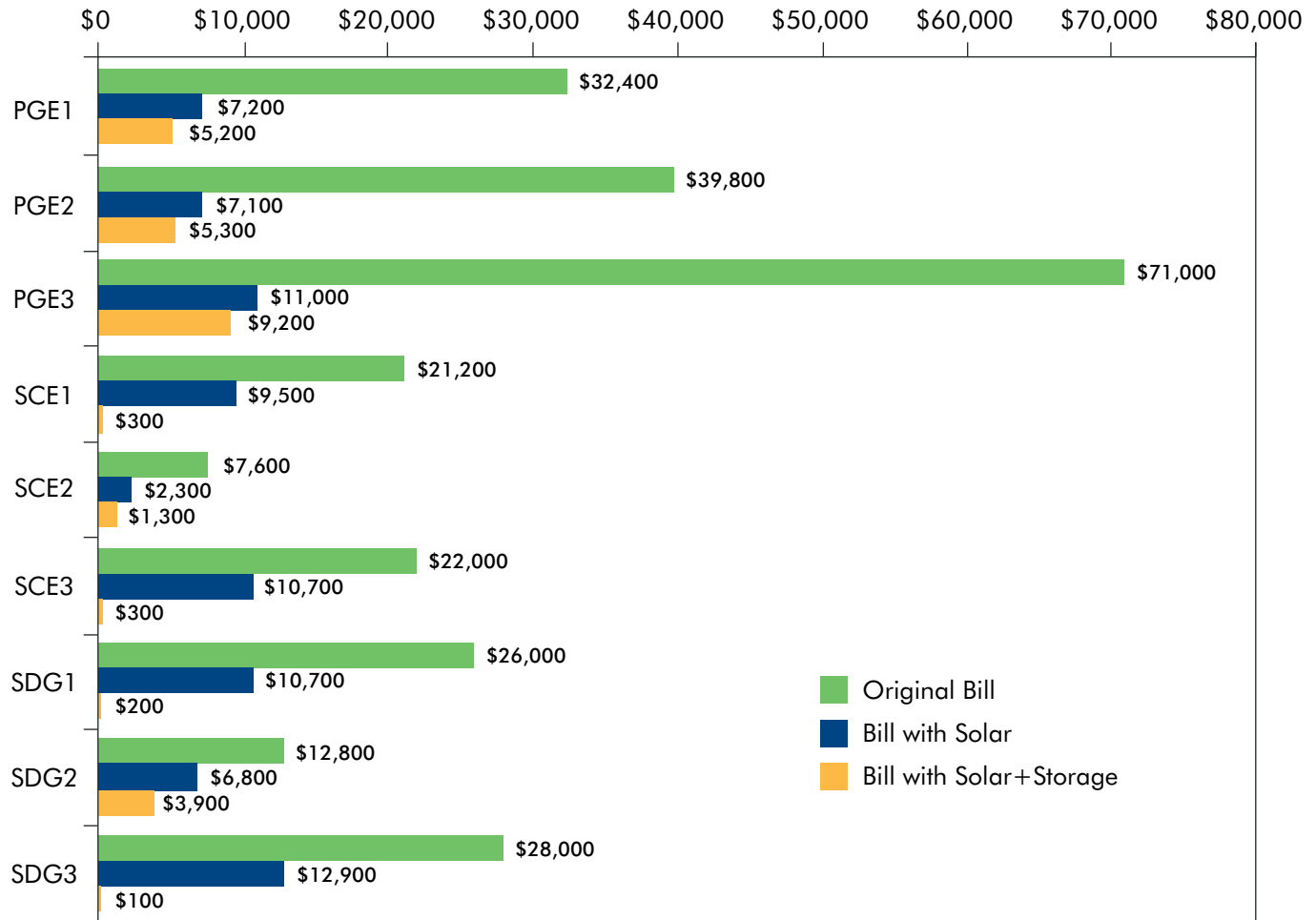
The addition of battery storage can reduce or even eliminate the remaining demand charges for building owners (see Figure 1). The analysis found that solar + storage deployed in certain buildings could lower electricity demand below a utility defined threshold, 20 kilowatts for both Southern California Edison (SCE) and San Diego Gas & Electric (SDG&E), allowing property owners to switch to a utility rate structure with no demand charges. This reduction in electricity demand not only eliminates the demand charge costs but also removes the need for certain metering and billing expenses, which can add significant fixed charge expenses to an annual utility bill.

The end result of pairing battery storage with solar can be as drastic as a \$13,000 reduction in demand charge costs each year, leading to total annual electricity costs amounting to no more than about \$100 in fixed charges. Of course, buildings that are below the demand threshold may already be on a rate tariff without demand charges, and thus may not have the same economic incentive to install batteries to complement their solar system.

Pacific Gas & Electric (PG&E) currently has a much higher threshold for non-demand charge rates, 75 kilowatts. While the buildings within PG&E analyzed in this study have demand profiles below this threshold, because PG&E rate structures have comparatively low demand charge rates, it is more economic for these buildings to be billed for both energy and demand charges, instead of switching tariffs to one with increased energy charges and no demand charge. Because demand charges are lower in PG&E than the other investor-owned utilities and there is no economic incentive to switch to a rate structure that does not include these charges, the value proposition for storage is typically lower in this territory.

FIGURE 1

### Annual Electricity Bill for Building Common Area Load after Deployment of Stand-Alone Solar and Solar+Storage



## FINDING NO. 2

Adding battery storage to California affordable rental housing can almost double the building electricity bill savings achieved over the savings realized through solar alone.

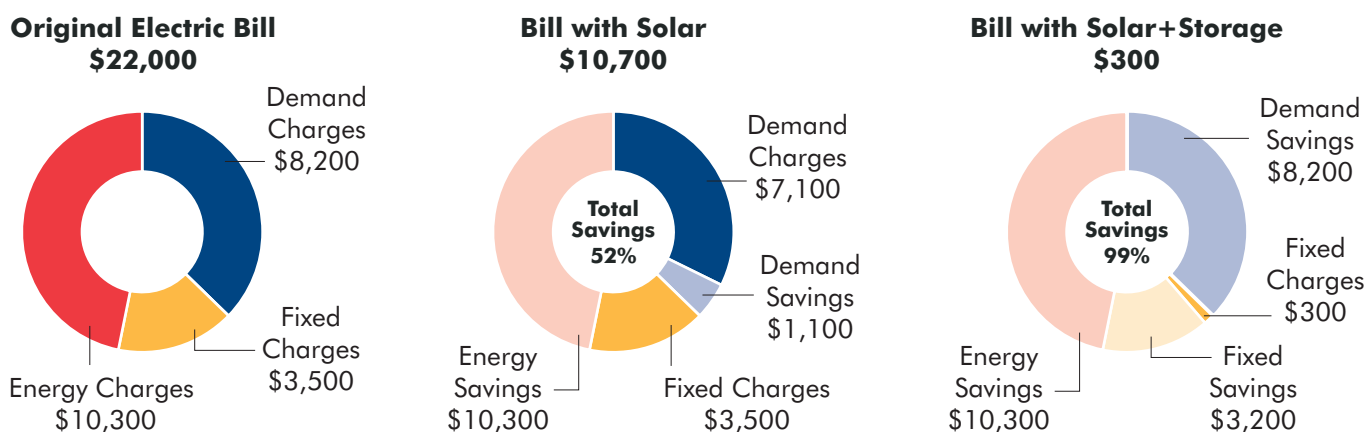
As mentioned in the previous finding, the amount many building owners pay for the kilowatt-hours that their property consumes only accounts for around half the cost of their electric bill. Solar can help reduce the remaining costs, but only battery storage can dependably manage and potentially eliminate the cost-per-kilowatt portion of a building's electric bill based on demand.

The economic analysis found that, in some cases, the addition of battery storage had the potential to almost double the utility bill savings that could be achieved by an affordable rental housing property owner over solar-alone systems.

For example, as shown in Figure 2, building SCE3 saved \$11,400 with solar and an additional \$10,300 with the incorporation of battery storage, a 90 percent increase in savings over stand-alone solar. These additional savings from storage, while not directly lowering tenant electricity bills, can be passed through to affordable housing tenants or used to improve the property in other ways beneficial to residents, such as designing the solar+storage system to provide backup power in emergencies. The value proposition for tenants will likely improve with upcoming changes to utility rate structures such as time-of-use rates and NEM policies, which will be explored in the third report of this series.

FIGURE 2

### Example of Impacts from the Addition of Solar and Solar+Storage on Electricity Bills



SCE3 building original electric bill, electric bill and savings after deployment of solar, and electric bill and savings after deployment of solar+storage. Solar eliminates energy consumption expenses and lowers demand charges, saving \$11,400. The addition of battery storage eliminates demand charge expenses and lowers fixed charges, saving an additional \$10,300 per year.

## FINDING NO. 3

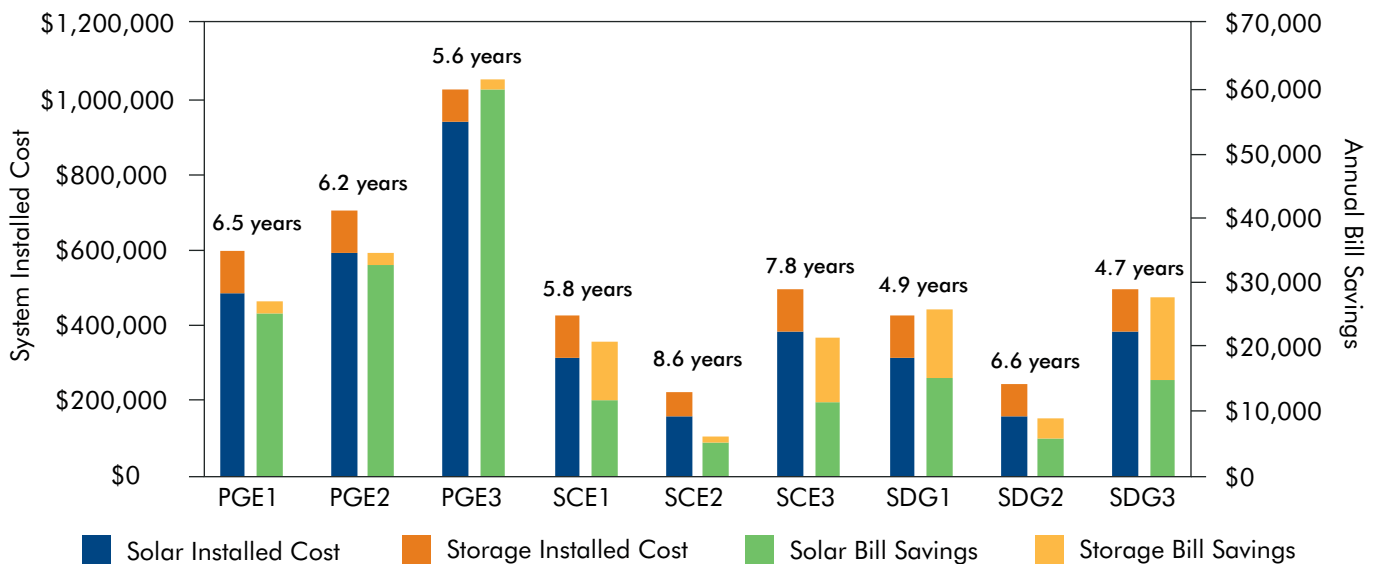
Adding battery storage can achieve incremental utility bill savings similar to solar for about a third of the cost of the solar system for owners of affordable rental housing properties in California.

The addition of battery storage to an affordable multi-family rental housing solar project can result in incremental savings essentially equal to those achieved through solar alone, while only increasing the installed cost of a project by about a third of the cost of the solar-only investment.

For example, in the analysis of the SDG3 installation, a \$385,000 solar system was modeled to completely offset

building electricity consumption. It saved about \$15,000 per year. Due to the batteries' ability to manage demand below a 20 kilowatt threshold, adding a \$112,100 battery storage system, at about a third the cost of the solar system, increased annual savings to \$27,900. That amounts to an 85 percent increase in total savings for only a 29 percent increase in cost.

FIGURE 3  
Installed Costs and Bill Savings for Building Common Area Loads



Installed cost of solar and battery storage systems to cover building common area loads (left axis) and the resulting annual electricity bill savings for the building (right axis). Project payback periods range from 4.7 to 8.6 years, noted above bars. Note that project payback periods factor in all available incentives.

## FINDING NO. 4

### Solar+storage projects result in a significantly shorter payback period than stand-alone solar projects.

The economics for solar in California affordable multi-family rental housing are generally favorable.

The analysis found that the payback period for stand-alone solar projects offsetting building electricity consumption ranged from 5.6 to 10.5 years, and 4.8 to 8.8 years for solar offsetting tenant electricity consumption.

While these time frames are well below the expected life of a solar project, the analysis found that incorporating battery storage into a project reduced the payback period of stand-alone solar in every scenario analyzed. The payback reduction for property owners was quite significant in several cases. For the projects analyzed in this study, integrated solar+storage systems had a payback period of 4.7 to 8.6 years, shortening project payback by as much as 3.6 years and making for a much more favorable investment proposition (see Figure 3).

It is important to note that estimates of project payback and return on investment depend on a number of factors beyond the scope of this initial report. For instance, the results of these analyses assume that system owners are able to directly take advantage of available incentives, such as the 30 percent federal investment tax credit (ITC). Such considerations will be explored further in the second report in this series.

The results are also highly dependent on current utility rate structures and state NEM policies, both of which are subject to change. Under the scenarios analyzed in this study, 53 to 78 percent of solar energy generation was exported to the grid as non-coincident with customer electricity demand. A shift in rates and/or policy that decreases the value proposition for non-coincident energy export would further bolster the value of battery storage technologies.



## ABOUT CLEAN ENERGY GROUP

Clean Energy Group is a leading national, nonprofit advocacy organization working on innovative technology, finance, and policy programs in the areas of clean energy and climate change. Clean Energy Group, in partnership with Meridian Institute, founded the Resilient Power Project to help states and municipalities with program and policy information, analysis, financial tools, technical assistance, and best practices to speed the deployment of clean, resilient power systems in their communities. For more information, visit [www.cleanenergygroup.org](http://www.cleanenergygroup.org) and [www.resilient-power.org](http://www.resilient-power.org).



## ABOUT THE CALIFORNIA HOUSING PARTNERSHIP

The California Housing Partnership Corporation (CHPC) is a state-created nonprofit organization that helps to preserve and expand the supply of homes affordable to low-income households in California. CHPC does this by providing financial consulting services, technical assistance, trainings, policy research, and advocacy leadership to nonprofit and government housing organizations throughout the state. CHPC's efforts have leveraged more than \$8 billion in private and public financing to preserve and create more than 30,000 affordable homes for low-income households. In recognition of the key role that energy and water costs play in the long-term financial feasibility of operating affordable housing developments, CHPC runs the Green Energy Rental Home Energy Efficiency Network (GREEN), a coalition of more than 80 affordable housing, environmental, and resource efficiency organizations. For more information, visit [www.chpc.net](http://www.chpc.net).



## ABOUT THE CENTER FOR SUSTAINABLE ENERGY®

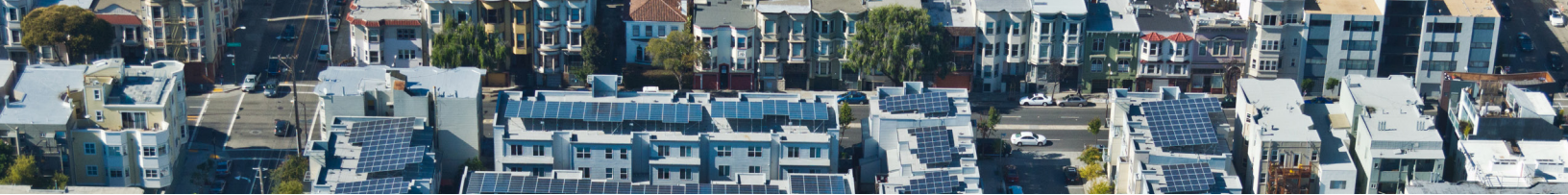
Founded in 1996, the Center for Sustainable Energy (CSE) is a mission-driven nonprofit, providing clean energy program design and management, and technical advisory services. Governments, regulators, utilities, businesses, property owners and others look to CSE as an objective implementation partner to develop customized solutions that help lower energy costs and increase consumer choice and accessibility to clean energy technologies. CSE's suite of services includes expertise in transportation, energy efficiency and building performance, research and analysis, emerging technologies, policy support, workforce development, and marketing, education and outreach. Headquartered in San Diego, CSE works nationwide with support of offices in Los Angeles and Boston and Oakland, Calif. For more information, visit [www.energycenter.org](http://www.energycenter.org).



## ABOUT GELI

Geli provides software and business solutions to design, automate, and manage energy storage systems. Geli's suite of products creates an ecosystem where project developers, OEMs, financiers, and project operators can deploy advanced energy projects using a seamless hardware-agnostic software platform. For more information, visit [www.geli.net](http://www.geli.net).





## ABOUT THE RESILIENT POWER PROJECT

The Resilient Power Project, a joint initiative of Clean Energy Group and Meridian Institute, is working to accelerate market development of solar PV plus battery storage (solar+storage) technologies for resilient power applications serving low-income communities. The Resilient Power Project works to provide new technology solutions in affordable housing and critical community facilities to address key climate and resiliency challenges facing the country:

- **Community Resiliency** — Solar+storage can provide revenue streams and reduce electricity bills, enhancing community resiliency through economic benefits and powering potentially life-saving support systems during disasters and power outages.
- **Climate Adaptation** — Solar+storage systems can provide highly reliable power resiliency as a form of climate adaptation in severe weather, allowing residents to shelter in place during power disruptions.
- **Climate Mitigation** — Battery storage is an enabling technology and emerging market driver to increase adoption of solar PV for distributed, clean energy generation and to advance climate mitigation efforts.

The Resilient Power Project is supported by The JPB Foundation, Surdna Foundation, The Kresge Foundation, Nathan Cummings Foundation, and the Barr Foundation.



Learn more about The Resilient Power Project at  
[www.resilient-power.org](http://www.resilient-power.org).



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