

Local Government's Role in Community Based Energy Resiliency

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ABSTRACT

In July 2021, the Governor of California issued a State of Emergency Proclamation highlighting the volatility of California's electric grid due to the increasing impact of climate change. Communities across California are increasingly impacted by energy supply shortfalls and must accelerate the implementation of solutions that support the grid and provide resiliency to the state's most impacted communities.

Public agencies are responsible for the safety of their communities and must provide critical services during power outages. For example, public agencies ensure emergency operations such as water pumping, fire and police services, emergency medical response, cooling centers, and many other similar activities remain operational. The increasing frequency and gravity of extreme weather and grid outages put undue pressure on hard-to-reach community members and disadvantaged communities, which have been disproportionately affected by grid outages. Critical facilities are often located in these same communities, and back-up diesel generators required for community resilience further exacerbate air quality issues. Community and grid resilience are inextricably linked, and only local government can address their joint objectives.

With the rising costs of energy and the increased volatility in grid resilience and reliability, new streamlined, transparent, and equitable models to build out resiliency projects must be made available to rural, disadvantaged, and low-income communities. The State can no longer rely on status quo models to meet the current state of emergency our communities are currently facing. This paper explores a regional approach to local solutions and three case studies of critical facilities that strengthen both community and grid resiliency through public agency driven integrated energy efficiency and distributed energy investment models.

Introduction

As Los Angeles County experiences changing climate conditions, heat waves are projected to be more severe, prolonged, and frequent. U.S. average temperatures have increased by 1.3°F to 1.9°F since record-keeping began in 1895. The most recent decade was the hottest on record, and the National Oceanic and Atmospheric Administration (NOAA) is projecting this year to be Earth's warmest on record. By 2050, the Los Angeles County region could see 4-5° F increases in the average maximum temperatures (Bedsworth et al. 2018). Urban heat islands, extreme heat events, long-term temperature increases, and heat-related drought stem from changing climate conditions, impacting county residents and critical infrastructure reliability. There is a need to continue to operate essential infrastructure while reducing or eliminating County facilities' demand on the electric grid.

On July 30, 2021, Governor Gavin Newsom issued a Proclamation of a State of Emergency (“Proclamation”) in response to the significant and accelerating impacts of climate change in California. Key to the Proclamation was the need for resiliency and microgrid projects installed and delivering reliability benefits by Summer 2022 and/or Summer 2023 (Newsom 2021).

The County recognizes that the current climate crisis requires critical action and rapid deployment of new clean energy distributed energy resource (DER) projects that couple energy storage, and renewable power to mitigate the risk of capacity shortages and provide net peak power during the high demand hours of 4:00 p.m. to 9:00 p.m. Under this context, the County of Los Angeles seeks to implement microgrid projects to address the need to optimize the reliability of power supplied to critical infrastructure, minimize the grid demand during peak system hours, and maximum support to the residents of the County of Los Angeles, all while prioritizing energy efficiency. The County's Board of Supervisors adopted OurCounty, the County's first-ever comprehensive sustainability plan. Goals 1 and 2 of OurCounty highlight the critical importance of investing in resilient infrastructure and addressing the health disparities of vulnerable populations. Goal 7 directs County operations to transition to zero-carbon energy systems; the County has initiated the process of identifying facilities that support critical operations needing large-scale backup power supply and areas that serve underrepresented and vulnerable populations (CoLA 2019).

To advance these objectives, the County has developed project case studies that build on best practices and historical successes while leveraging local government infrastructure to accelerate clean energy project development as soon as possible, with an eye toward the summers of 2022 and 2023 for net peak hours. These projects leverage existing infrastructure, prioritize local government DER investment to expedite the construction, procurement, and rapid deployment of new clean energy and storage projects to mitigate the risk of capacity shortages and increase the availability of carbon-free energy at all times of day.

The County has further developed this model to leverage its existing infrastructure of energy efficiency programs and networks to advance local resiliency projects through its public agency partners. Preliminary funding has been identified and successfully deployed through County funding and external grants, but further funding is required to expand access to underserved communities and align those efforts with the urgent needs of the State of California.

Local Solutions for Integrated Investments

The County has advanced through the California Public Utilities Commission (Commission) proceeding on Microgrids a potential solution for a local government-led microgrid incentive program (CoLA 2021). Although this has not been approved for funding, the County will continue to advocate for these types of solutions to ensure equitable access to the services and funding required to build out community and grid resiliency projects. In 2012, the Commission recognized the potential benefits and alternative administrative structures for the deployment and implementation of clean energy projects. The Commission recognized that local governments not only had access to additional funding sources that provided supplemental resources to help achieve Statewide goals, but also had a historical track record of implementing regionally localized clean energy programs and in fact, many local governments were better positioned to administer programs, specifically energy efficiency (EE) programs, than they had

previously discerned. With that, in 2012, the Commission authorized the County to implement a Regional Energy Network portfolio, the Southern California Regional Energy Network (SoCalREN) (CPUC 2012).

The County, through SoCalREN, implements EE programs and services for residents, businesses, and public agencies within a region that encompasses all or part of 12 counties, over 700 public agencies and 20 million people—representing roughly half of California’s population. As a regional government organization representing hundreds of public agencies and their constituents, SoCalREN leverages public sector resources and expertise to provide turnkey solutions to its constituents. SoCalREN’s EE portfolio is unique in California as it was built to continuously engage local communities to expand EE efforts over time with the objective of reducing costs, increasing resiliency, and implementing local climate solutions. SoCalREN’s ongoing relationship with public agencies, and its understanding of these agencies’ energy infrastructure needs and plans, could be leveraged to enable the implementation of immediate solutions to alleviate stress on the grid. EE programs with strong customer level relationships in the public sector are ideal starting points for expanded resiliency offerings. The County has the capacity and capability to provide more offerings than currently authorized by the Commission.

With the appropriate incremental funding for DER and microgrid solutions, the County could expand its current portfolio of energy efficiency programs and work with the 211 actively enrolled public agencies to advance rapid and distributed strategies that target 4:00 p.m. to 9:00 p.m. peak demand reduction, with a priority focus on underserved and disadvantaged communities. By leveraging a regional approach that mirrors the existing SoCalREN structure, the potential to engage public agencies and lead them toward more clean energy investment is magnified due to the vast geographical reach. SoCalREN gives the County direct access to established public sector networks of customers, qualified contractors, and third-party implementers, with over 11.2 MW of identified and 5.6 MW of installed projects to date, just in the public sector. This same network could be directly leveraged to meet the current emergency needs.

The County proposed to the Commission a Regional Microgrid Incentive Pilot Program which mirrors its SoCalREN administration, governance, and funding structure (CoLA 2021). The 12-County regional program would help public agencies implement resiliency strategies and microgrid projects through a pathway that expands upon past and planned customer EE plans.

Traditional Models Continue to Prevail

In response to a Commission ruling addressing the urgent need of the Governor’s Proclamation (CPUC 2021a), the County submitted a comprehensive proposal including a funding mechanism to enable a local government microgrid incentive program that would complement EE programs as described above (CoLA 2021). The turnkey proposal was set to deliver peak demand reductions and increase resiliency of local southern California communities in 2022 and 2023.

Unfortunately, the proposal was not adopted by the Commission. The Commission did not provide details as to why the proposal was rejected but did recommend that the County pursue acceptance of individual projects into the anticipated Microgrid Incentive Program (MIP). MIP however is a pilot effort limited to in-front-of-the-meter projects making many of the behind-the-meter projects typical in critical facilities ineligible for participation.

Instead of approving this program proposal in D.21-12-004, the Commission approved more traditional investments by the investor-owned utilities (IOUs) (CPUC 2021b):

- San Diego Gas & Electric proposed up to four circuit-level projects to be implemented by 2024.
- Pacific Gas & Electric proposed a study to “determine what infrastructure upgrades and studies would be required” to allow temporary diesel generation at the substation level.

The County continues to explore funding opportunities to bring these solutions to local public agencies.

Public Agencies Infrastructure Projects can Increase Community Resiliency

The County of Los Angeles has developed three case studies of successful EE projects at buildings/sites where DER and microgrid solutions could be deployed to increase the resilience and reliability of critical government facilities. These case studies, at various stage of implementation, are presented below to illustrate the types of projects and economics of such public agency projects.

Case Study 1: Eastern Avenue Emergency Operations Microgrid

The County of Los Angeles Department Eastern Complex contains the Emergency Operations Bureau, Sheriff Fleet Management and Academy Training Centers, Fire Department Headquarters, and emergency communications systems. This complex has been operational throughout the COVID-19 pandemic and serves as a critical operations facility. It is located in East Los Angeles, an area with a high CalEnviroScreen score of over 90 percent and surrounded by a population with a 96 percent pollution burden. The facility runs backup generators to provide backup power given the critical nature of the facility, further leading to high particulates in the area.

The complex, with a recently completed 1.8 MW solar array, is an ideal location to add energy storage to support the County’s critical operations during emergency conditions. With \$2.75M in funding to support this project, 1 MW and 4 MWh of energy storage can be connected to the local grid to provide support services, reduce localized particulate emissions, and help meet statewide energy storage needs.

Project Description

The County seeks to install a grid-tied battery storage system to provide backup power during outages, shift load during high usage times and peak hours, and meet grid demand response needs. The facility's footprint will allow the addition of apparatus to facilitate constructing a behind-the-meter microgrid that will increase the facility's reliability and shed load on the electric grid by up to 1,017 kW battery power (4,235 kW-h capacity) during peak hours running 50 percent of the base building load. A combination of a recently completed 1.8MW solar array with a new battery storage system integrated with existing backup generators in a microgrid configuration will provide additional resiliency and support local grid operations.

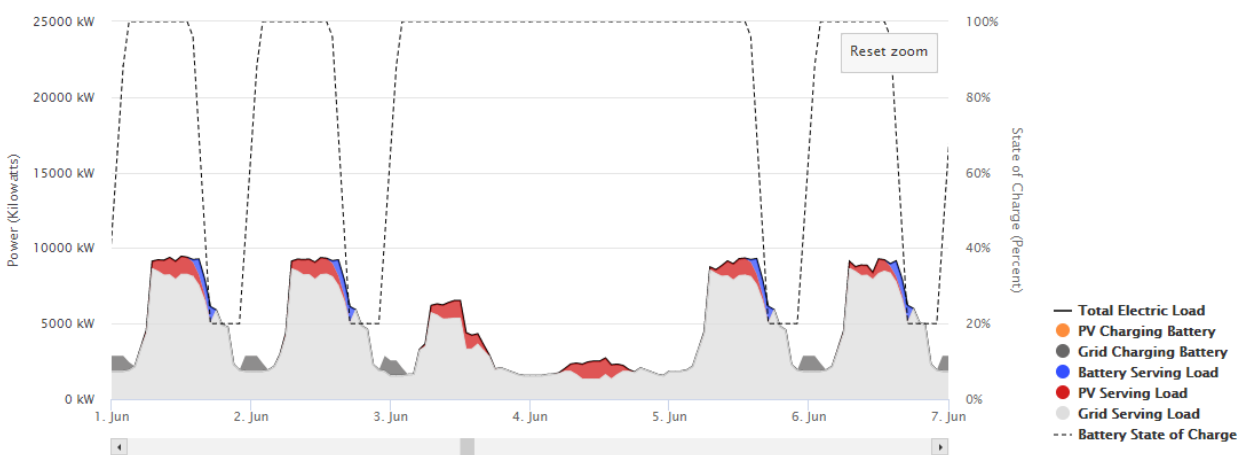
Establishing a microgrid at this complex is also expected to benefit nearby residents and businesses as the project will improve regional grid reliability.

Technical Measures and Applications

The required battery storage was calculated using National Renewable Energy Laboratory's (NREL) REopt modeling tool. The following parameters were used in the battery sizing model:

- Average yearly consumption of 39 GWh
- 1,800 kW existing rooftop solar
- Four (4) hour duration outage mitigation
- 50 percent complex-wide energy capacity maintained during peak times
- The battery is assumed to discharge to a minimum of 20 percent capacity

Figure 1. Simulated Load Profile with Combined BESS and Existing Solar



Based on these simulations, the County determined the following optimal solution:

Battery Energy Storage System (BESS) power: 1,017 kW

Battery Energy Storage System (BESS) capacity: 4,235 kWh

Estimated Project Costs and Incentives

The County assumed a cost estimate of \$1,500 per kWh for the battery system and inverter as well as installation in a microgrid configuration. This higher-than-average cost estimate per kWh assumes a complex installation and microgrid configuration on a critical government facility and is a conservative estimate. Published costs for more typical non-critical installations can range from \$300-\$700/kWh (Cole et al. 2021). The County's estimate included the use of existing incentives such as the Statewide Self Generation Incentive Program (SGIP) where possible.

Table 1. Project Cost and Potential Incentive

Measure Description	Nominal System Size (kWh)	Estimated Installed Cost (USD)	Potential SGIP Incentive (USD)	Net Measure Cost (USD)
BESS	4,235	\$6,352,500	\$3,599,750	\$2,752,750

Case Study 2: Los Angeles Department of Public Health Solar and Battery Storage

The County of Los Angeles' facilities in Baldwin Park houses the Department of Public Health's Environmental Health Division's Headquarters and has labs for environmental sample testing and analysis services, including water and wastewater toxicology assessments. Samples are stored and tested on-site and building systems must be kept operational. This facility has been operational throughout the COVID-19 pandemic and serves as a critical operations facility. It is located in an area with a high CalEnviroScreen score of 95 percent and surrounded by a population with a 94 percent pollution burden. The facility runs backup generators to provide backup power given the critical nature of the facility, further leading to high particulates in the area.

Establishing a behind-the-meter microgrid at this facility will increase the operations' reliability and reduce energy demand during peak hours, while increasing regional grid resiliency. This benefits Los Angeles County residents and other customers in that utility district. With \$900k in funding to support this project, 500 kW of solar and 1,000 kWh of energy storage could be connected to the local grid to provide support services and help meet statewide energy storage needs.

Project Description

The County plans to install a grid-tied hybrid microgrid system to provide backup power during outages, shift load during high usage times and peak hours, and meet demand response needs. The facility's footprint will allow the addition of apparatus to facilitate constructing a behind-the-meter microgrid that will increase the facility's reliability and shed load on the electric grid by up to 500kW via solar array and 1,000 kWh from battery storage during peak hours.

Establishing a microgrid at this complex will increase the operations' reliability and reduce energy demand during peak hours. This is expected to benefit not just nearby residents and businesses, but also regional grid reliability.

Technical Measures and Applications

The required solar array and battery storage solution was calculated using the NREL REopt modeling tool. The following parameters were used in the battery sizing model:

- Average yearly consumption of 4 GWh
- 500 kW maximum PV size
- 1,000 kWh battery capacity
- Four (4) hour duration outage mitigation

50% complex-wide energy capacity maintained during peak times
The battery is assumed to discharge to a minimum of 20% capacity

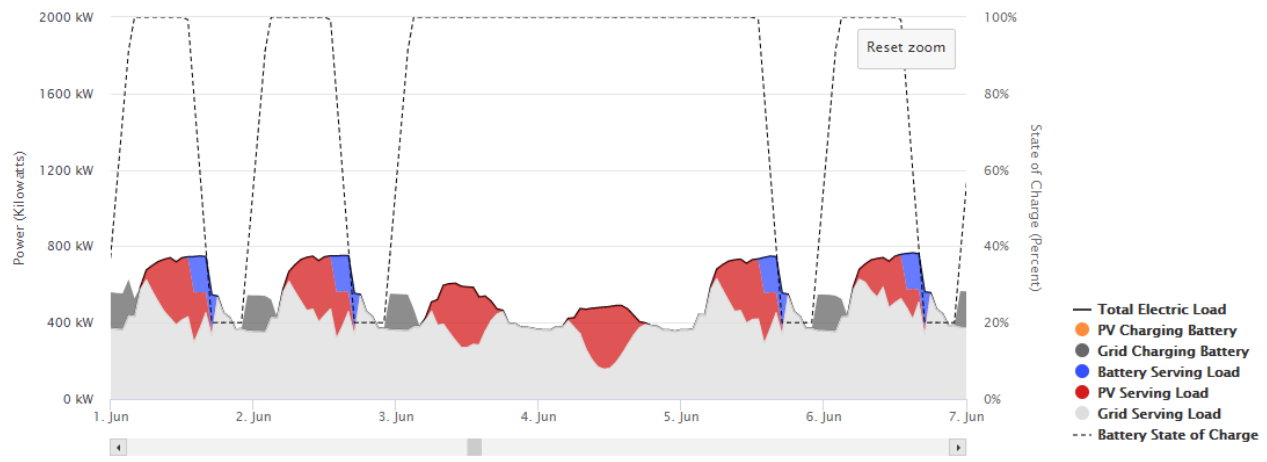


Figure 2. Simulated Load Profile with Combined BESS and Solar Carport

Based on these simulations, the County determined the following optimal solution:

- Battery Energy Storage System (BESS) power: 188 kW
- Battery Energy Storage System (BESS) capacity: 1,000 kWh
- Solar Carport power (PV): 500 kW (779,707 kWh per year)
- GHG reduction of 415 tons per year

Estimated Project Costs and Incentives

The County cost estimate assumes \$1,500 per kWh for the battery system, \$3,500 per kW for a solar carport, and inverter as well as installation in a microgrid configuration. This slightly higher than average cost estimate per kWh assumes a complex installation and microgrid configuration on a critical government facility. The County would utilize SGIP incentives where it is possible to lower the cost of the battery system and is likely to finance most of the solar through a Power Purchase Agreement (PPA). This allows the County to substantially reduce the cost of this project but would still require incremental funding to complete.

Table 2. Project Cost and Potential Incentive

Measure Description	Nominal System Size	Estimated Installed Cost (USD)	Potential SGIP Incentive (USD)	Financed through PPA	Net Measure Cost (USD)
BESS	1,000 kWh	\$1,500,000	\$850,000	-	\$650,000
PV	500 kW	\$1,750,000	-	\$1,500,000	\$250,000
Total					\$900,000

Case Study 3: Pitchess Detention Center Solar and Battery Storage

The County of Los Angeles' Sheriff's Department operates the 2600-acre Peter J. Pitchess Detention Center Campus (PDC) which is located in the northern part of the County and is in a Commission Tier 3 Extreme High Fire Risk Area. PDC is made up of multiple jails holding nearly 10,000 inmates and is the largest jail complex for the County. The facility is considered an essential complex located in Castaic, CA, an area with a moderate CalEnviroScreen score of 69 percent and surrounded by a population with a 58 percent pollution burden. PDC is served by two SCE circuits feeding a substation on the campus with available capacity to add solar and storage, as until 2018, the County operated a 25MW cogeneration plant at the site.

Establishing a behind-the-meter microgrid at this facility will increase the operations' reliability and reduce energy demand during peak hours. With \$15M in funding to support this project, 20 MW of solar and 20 MWh of energy storage can be connected to the local grid with available capacity on the substation to provide support services and help meet statewide energy storage needs.

Project Description

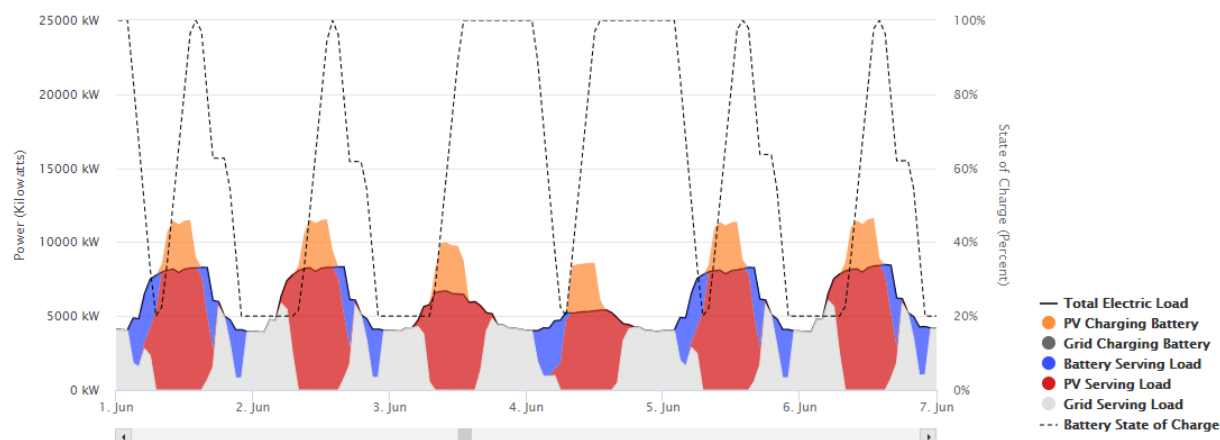
The County plans to install a grid-tied hybrid microgrid system to provide backup power during outages, shift load during high usage times and peak hours, and participate in demand response events. The facility's footprint will allow the addition of apparatus to facilitate constructing a behind-the-meter microgrid that will increase the facility's reliability and shed load on the electric grid by up to 20MW via solar array and 20MWh from battery storage during peak hours. As illustrated on the graph below battery power is about 3.2MW reducing peak load during 4:00 p.m.–9:00 p.m. to 4-6MW.

Technical Measures and Applications

The required solar array and battery storage solution was calculated using the NREL REopt modeling tool. The following parameters were used in the battery sizing model:

- Average yearly consumption of 53 GWh
- 20 MW maximum PV size
- 20 MWh battery capacity
- 50 percent complex-wide energy capacity maintained during peak times
- The battery is assumed to discharge to a minimum of 20 percent capacity

Figure 3. Simulated Load Profile with Combined BESS and Solar



Based on these simulations, the County determined the following optimal solution:

- Battery Energy Storage System (BESS) power: 3,250 kW
- Battery Energy Storage System (BESS) capacity: 20,000 kWh
- Solar power (PV): 20,000 kW (33,523,603 kWh per year)
- GHG reduction of 15,584 tons per year

Estimated Project Costs and Incentives

The County's cost estimate assumes \$1,000 per kWh for the battery system at this scale, \$2,500 per kW for ground mounted solar, and inverter as well as installation in a microgrid configuration. This slightly higher than average cost estimate per kWh assumes a complex installation and microgrid configuration on a critical government facility. The County would utilize available SGIP incentives where possible to lower the cost of the battery system and finance most of the solar through a PPA.

Table 3. Project Cost and Potential Incentive

Measure Description	Nominal System Size	Estimated Installed Cost (USD)	Potential SGIP Incentive (USD)	Financed through PPA	Net Measure Cost (USD)
BESS	20 MWh	\$20,000,000	\$5,000,000	-	\$15,000,000
PV	20 MW	\$50,000,000	-	\$50,000,000	\$0
Total					\$15,000,000

Conclusion

Public agencies operate critical facilities which must operate during grid outages and could serve as the locations of microgrids meant to support local grid resiliency. With the current State of Emergency, there is an immediate opportunity leverage the existing regional administration of EE programs to expand EE project pipelines in critical infrastructure and facilities to advance resiliency projects. In SoCalREN territory alone, a public agency led microgrid incentive program would have direct access to engage with 11 counties and more than

700 public agencies, exponentially expanding the potential of available clean energy deployment.

In this approach, strategic public facilities would maintain critical operations during grid stress events and also provide dispatchable and/or ancillary services to the grid when emergency events occur—which would be made possible by streamlined microgrid deployments. Public safety is a primary role of public agencies, and this approach would result in significant demand flexibility, grid services, and critical infrastructure resilience.

The uniqueness of public agency responsibilities requires such a program to meet the joint objectives of grid resiliency and community resiliency. The State can no longer rely on status quo models to meet the current State of Emergency our communities are facing. If collectively we continue not to advance new models or pilots, we will fall further behind in addressing this climate emergency. If we continue to delay implementation of models that would provide green alternatives, the current inequities of environmental justice faced by rural, disadvantaged communities, and low-income communities will be amplified. It is critical that funding is allocated to local public agencies to advance grid resiliency projects which also enable community resilience and public safety.

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