

## Microgrid Demonstration Project at City of Fremont Fire Stations

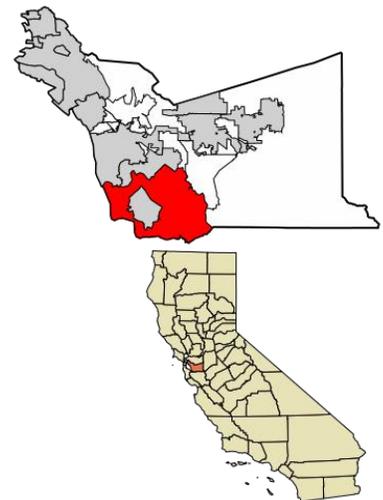
Three City of Fremont Fire Stations are benefitting from a microgrid energy demonstration project that pairs solar photovoltaic (PV) carports with large battery systems to allow the facilities to generate and store their own energy, acting like mini power plants. The project is a public-private partnership between the City of Fremont, the Fremont-based clean technology firm Gridscape Solutions (Gridscape), and the California Energy Commission (CEC). The goal of the demonstration project is to show how such microgrid energy systems can provide added resiliency to critical public facilities by “islanding” (or operating separately) from the grid in the case of an emergency; the added benefits are that the City will reduce its greenhouse gas emissions while saving significantly on utilities through solar generation and battery storage instead of drawing power from the electric grid during peak usage times. In addition, the project supports local cleantech entrepreneurship and has served as an important economic development tool.

Case study

December 2017

### Summary

The City of Fremont is partnering with a local cleantech company, Gridscape, and the CEC under a microgrid demonstration project to bring solar energy and battery systems to three of their fire stations. Gridscape received a CEC grant of \$1,817,925 and matched an additional \$657,260 for a project total of \$2,475,185. Through the CEC grant, Gridscape will design, construct, and demonstrate the viability of microgrid systems consisting of 40kW solar photovoltaic carport canopies paired with 95kWhr battery energy storage units and smart controllers at three City of Fremont Fire Stations for a period of no less than one year, whereby all energy produced by the systems would be provided to the City at no cost. The system will be owned and maintained by Gridscape for the grant duration and past the grant, which significantly reduces the administrative management needs for the City. After the grant, the City of Fremont will then enter into a 10-year power purchase agreement (PPA) to get clean energy from the system at half the cost of energy from the public utility.



**Population/land area**

233,136 / 87.61 sq. mi

Overall, the project is estimated to save approximately \$250,000 from electric bill savings during the demonstration period and 10-year PPA term. The project will allow the City of

Fremont to show how microgrid energy systems can increase resiliency to critical service facilities by “islanding” (or operating separately) from the grid in the case of emergencies. Additionally, the City will reduce its greenhouse gas emissions, reduce demand on the power grid through the use of a stored energy battery, save on electricity bills via solar generation, and support innovation by a local cleantech company.

## Project Context

Microgrid systems are localized grids that can disconnect from the traditional grid and operate autonomously. This allows the site to be energy independent in the case of emergencies when the larger grid loses power, such as during earthquakes or severe storms, and help mitigate grid disturbances for faster system recovery time. When partnered with a local clean energy source such as solar, microgrid systems can reduce energy losses in transmission and distribution while increasing overall efficiency in electricity delivery. Generation of local energy may also result in cheaper electricity costs. Integrating battery storage further allows the site to reduce demand on grid services and extend the utility of solar energy past the daylight hours. Overall, such a system will greatly improve a site’s resilience.

There are a number of clean energy microgrid demonstration projects underway within California and across North America in a variety of sectors and hosts, such as in Santa Monica, Oakland, and Berkeley. The CEC produced a report in 2017 on the roadmap to commercializing microgrids. While microgrids show great potential, there are significant issues to work through, including different ownership and business models, clarifying the value proposition, and scaling up. The next stage in microgrid development is to explore the viability of larger facilities and campus-wide microgrids.



The completed microgrid at Fire Station 11 PHOTO CREDIT: CITY OF FREMONT.

## City Context

The City of Fremont is the fourth largest city in the San Francisco Bay Area. Located in northern Silicon Valley, the City of Fremont is home to a broad variety of innovative firms including over 1,200 high tech, life science, and clean technology firms, including Tesla, Inc., Lam Research Corporation, ThermoFisher Scientific, and Seagate. Industrial automation and Internet of Things (IoT) are also growing industries in Fremont. Fostering economic development and innovation is a major goal for the City; SizeUp.com ranked Fremont number one in the country for number of startups per capita. The City also takes a strong leadership role in climate and sustainability. The City of Fremont's Climate Action Plan was adopted in 2012 and calls for a 25% emissions reduction goal by 2020.

## Project Profile

The microgrid system at each of the three Fire Stations will consist of a battery energy storage system, smart inverters, a solar photovoltaic carport structure for renewable power generation, and energy visualization and control software that will monitor, collect, and display energy data. Gridscape's EnergyScope™—a cloud-based predictive distributed energy resource management software—will control when each facility draws energy from the grid or “islands” from the grid to only draw energy from the solar PV and battery storage. The microgrid systems will provide greenhouse gas-free electricity to the facilities and reduce power demand from the grid, thereby reducing utility bill costs and greenhouse gas emissions.

In Phase 1 of the project from 2016-2018, all energy generated by solar panels in the microgrid systems will first be supplied directly to the facilities for onsite use. Any additional energy generated will then be stored in the batteries. Once the batteries are full and cannot accept additional energy, the microgrid systems will export power to the grid, generating utility credits through net energy metering. When solar energy production slows or stops due to lack of sun, the facilities will draw power from the batteries until the batteries reach a minimal 3-hour supply of charge needed for a potential off-grid/islanding mode in the event of a power outage. When the facilities are unable to draw upon energy from either the solar or battery systems, they will receive power directly from the grid, drawing on net energy metering credits from excess solar generation.

Gridscape is tasked with demonstrating the viability of energy savings from the microgrid systems, increasing electrical infrastructure resiliency, and optimizing energy use to enable



“The public-private partnership forged between the City of Fremont and Gridscape Solutions demonstrates our dedication to supporting local cleantech entrepreneurship. Together, we are demonstrating how renewable energy storage systems help build resiliency in our community and create a clean energy future for Fremont.”

— Rachel DiFranco, City of Fremont Sustainability Manager

## Results

There are a number of concrete benefits from this project:

- Protection of critical facilities against power outages
- Reduced demand on the grid through use of stored battery energy
- Increased community resiliency
- Guaranteed clean energy system maintenance and monitoring
- Reduced utility bills by \$32,027 during the demonstration period, plus \$214,844 over the 10 year PPA term
- Reduced municipal greenhouse gas emission reductions by ~80,000 lbs/yr (~36 MTCO<sub>2e</sub>)
- Support of local cleantech company advancement and innovation with a strong tie to economic development goals

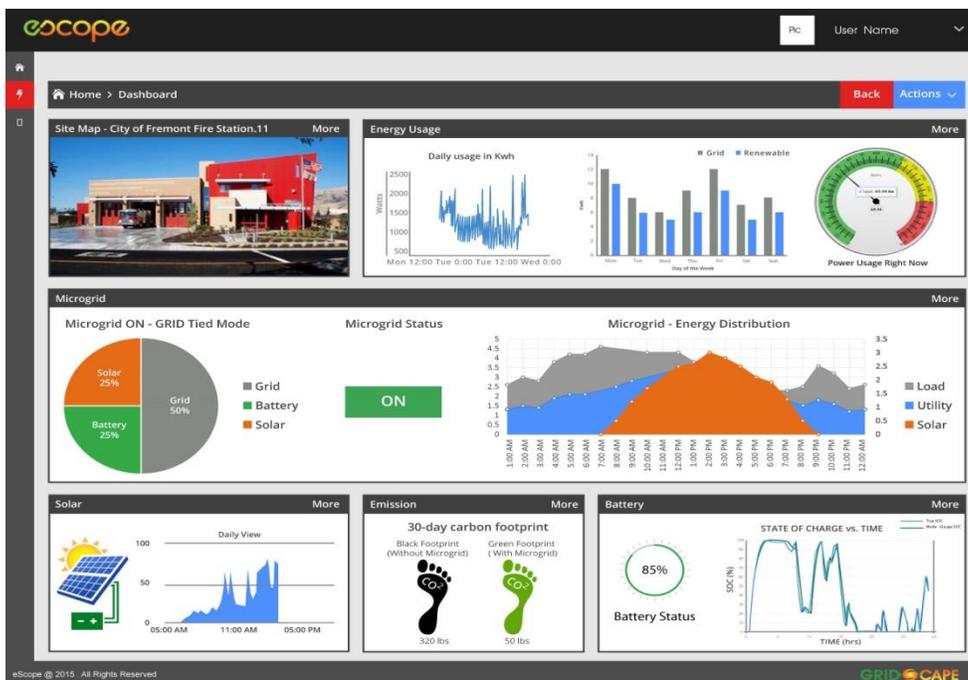
enable energy-smart critical facilities. Each Fire Station's microgrid system will undergo a demonstration period of a year, during which the City will receive all energy generated by the microgrid systems at no cost.

In Phase 2 of the project from 2018 to 2028, the City will benefit from reduced utility costs by continuing to utilize the microgrid systems via a power purchase agreement (PPA). Gridscape can provide electricity at half the cost of receiving electricity from PG&E. The purchase of power from these systems by Fremont without competitive bidding is allowable under California Government Code 4217.10 et seq, which authorizes public agencies to enter into an energy service contract when the City finds that the anticipated cost of the conservation services provided by an energy conservation facility will be less than the anticipated marginal cost of energy that would have been consumed in the absence of the project.

## Lessons Learned

The challenge with this project is navigating new legal and policy scenarios with cutting-edge technology. Gridscape's single inverter microgrid systems are designed differently than those currently approved by the CPUC. One of the issues was making sure that the battery system did not pull directly from the grid during low cost time and make money off PG&E. While

Gridscape engineered a solution on the software end, the CPUC ruling had not accounted for non-hardware fixes to separating the grid and the battery. Thus, PG&E had to send in a letter of support to show that the software fix was appropriate. Overall, the project demonstrates that CPUC rulings and other policies need to be more flexible as technology changes.



eScope Dashboard for microgrid PHOTO CREDIT: GRIDSCAPE.

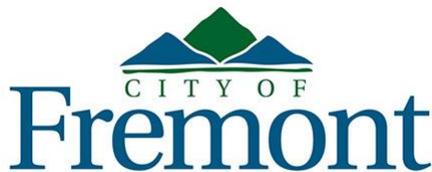
## Key Contacts

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## Budget and Finance

The project was financed through a public-private partnership between the City of Fremont, the Fremont-based clean technology firm Gridscape Solutions, and the California Energy Commission. Gridscape was awarded a grant of \$1,817,925 in 2015 to demonstrate a secure, reliable, and low-carbon based microgrid energy management system (Microgrid System) at three City of Fremont Fire Stations. They matched \$657,260 in funds and the City of Fremont provided in-kind support valued at \$80,000 in the form of staff time and leveraged energy efficiency improvements as its cost-share contribution.

During the microgrid demonstration period, the City will receive all energy generated by the microgrid systems at no cost, resulting in an expected utility savings in the first year of about \$32,000. After the grant finishes, the City will enter into a 10-year PPA to receive clean energy from the microgrid system at half the cost of electricity provided by PG&E. The projected electric savings from that is \$214,844, giving a total savings estimate of \$246,870 for the project.

This public-private partnership not only promotes new technology and potential sustainability measures for the City, but also supports a local company's efforts to scale solar photovoltaic systems, demonstrates Fremont's commitment to the industry, and advances Fremont's burgeoning smart city agenda.

## Next Steps

At time of writing, two of the microgrid sites are still waiting for permits while the other microgrid is up and running. Once the demonstration period finishes in 2018, the 10-year PPA will launch.

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