



Residential Solar + Energy Storage: Challenges and Opportunities

4.12 | Karyn Boenker - Public Policy Manager

Agenda

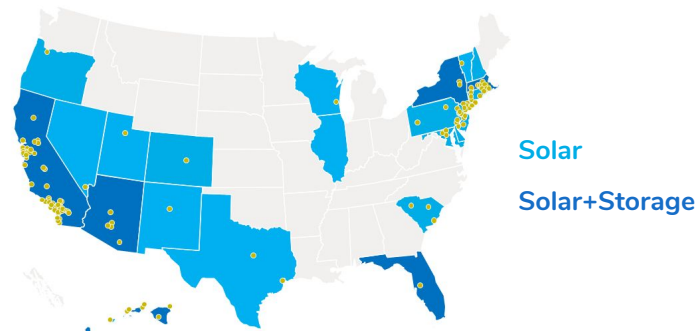
- Our Values
- Our Impact
- Two Pathways
- Grid Services
- Wildfire Mitigation



Who We Are

Formed in 2007, Sunrun pioneered the residential solar service product.

- Largest residential solar, storage, home energy services company, with more than 233,000 customers
- Deployed over 1.5GW of residential solar and currently operates in 23 states, plus DC and Puerto Rico
- Since 2017, Sunrun has installed over 5,000 battery storage + solar system and is the leading residential grid services provider
- Won a bid this year to provide 20MW of capacity from home solar + battery systems to ISO New England beginning in 2022.



Value to customer



Save on electricity



Little or no upfront cost



Backup power, no fuel or pollution



Bill management

Value to the Grid



Peak capacity



Resiliency



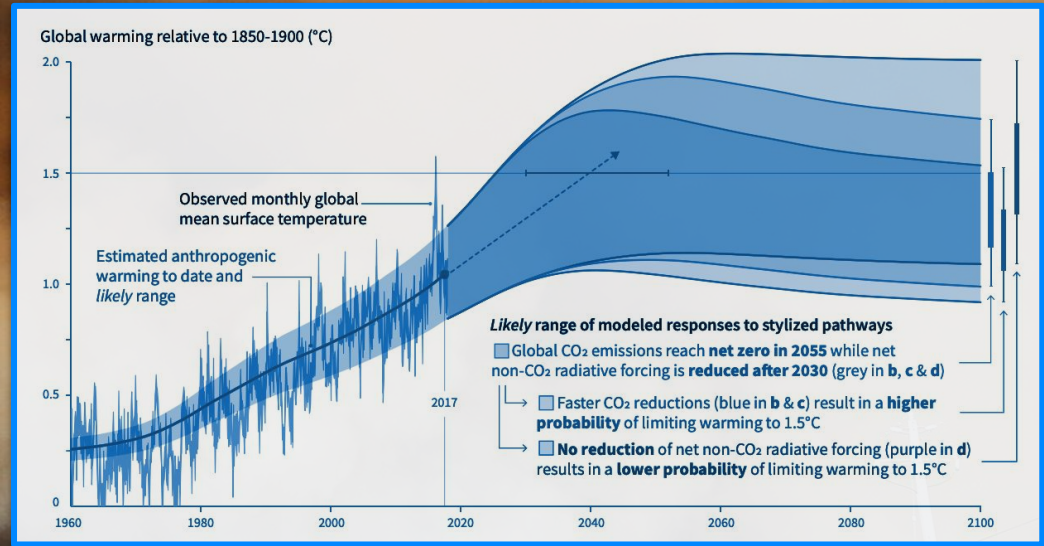
Dispatchable Virtual Power plant

Ancillary Services

Global Warming

We have 12 years.

There is no time for argument; sustainable energies like solar reduce air pollution and get our planet back on track for future generations.



Our Impact

Sunrun is giving households the freedom to create their own energy and take control of their energy future.



Sunrun installs a new solar system
every 2.3 minutes
on average.



We have deployed
1,575 megawatts

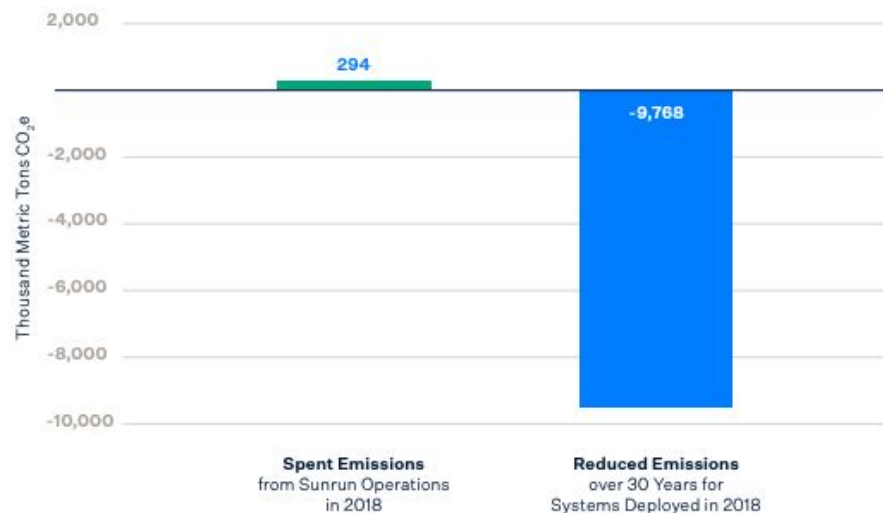


and now have
233,000 customers
as of the end of 2018



Our Impact

2018 System Deployments - Net Carbon Balance



Sunrun's systems have prevented greenhouse gas (GHG) emissions totaling

3.7 million metric tons

of carbon dioxide equivalent (CO₂e), an amount comparable to



eliminating more than
9 billion
passenger vehicle miles

OR



recycling nearly
1.3 million
tons of waste.⁴

The GHG emissions prevented by Sunrun's systems through 2018 are also comparable to the emissions prevented by not burning



421 million
gallons of gasoline

OR



1.86 million
metric tons of coal⁵



We Are Human Centered

Sunrun believes in a culture that values and respects diversity and inclusion.

2018/19 Highlights

Sunrun achieved 100% gender pay parity.

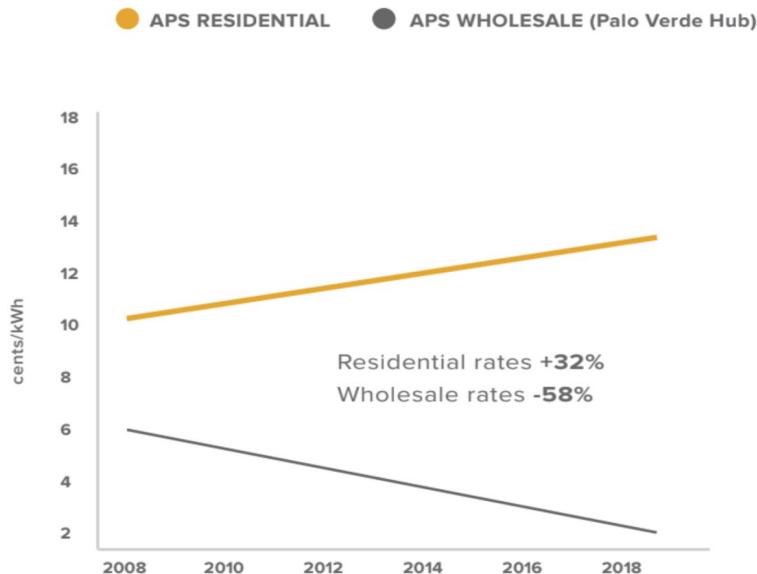
Sunrun has supported GRID Alternatives in installing more than 2,000 home-solar systems.

Sunrun committed to develop a minimum of 100 MW of solar on affordable multi-family housing in CA. This will directly benefit more than 50,000 families.

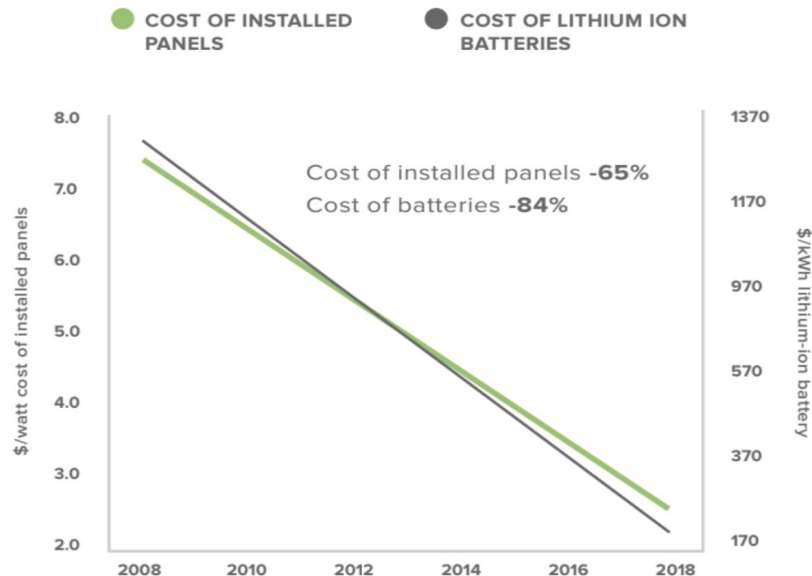


Increasing Value of Home Solar & Batteries

DECLINING WHOLESALE RATES DISGUISE COST OF CAPEX

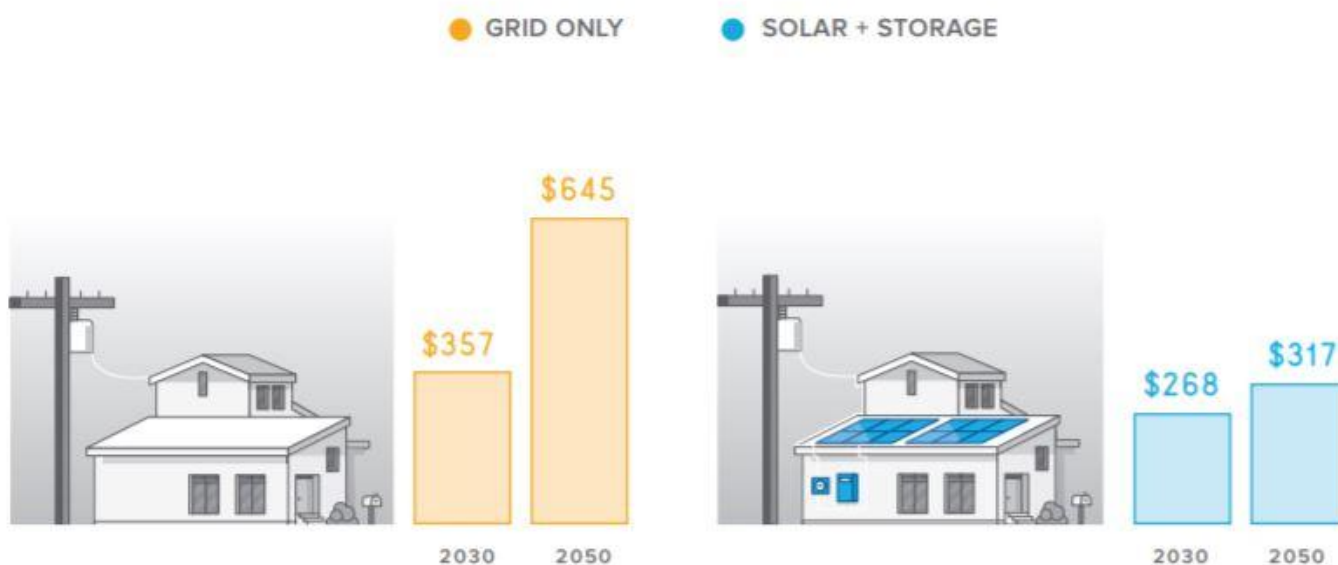


COST OF SOLAR MODULES AND BATTERIES HAVE DECLINED SIGNIFICANTLY



Westchester: A Case Study

AVERAGE MONTHLY ELECTRICITY BILL FOR A SAMPLE
RESIDENTIAL CUSTOMER FROM WESTCHESTER COUNTY, NY



Two Paths

Two Potential Futures



Brightbox

Sunrun Solar + Storage Products

During an outage, Sunrun's Brightbox battery system can power the home, providing households with a new degree of site-level resilience.

- TOU management
- Backup power during outages
- Grid Services
- Virtual Power Plants
- Efficiency



We have installed nearly
5,000
Brightbox systems



Extreme Weather On The Rise

Billion-Dollar Extreme Weather Disasters In The US, 2018



Western Wildfires

California Firestorm, Summer-Fall

Plains Droughts

Southwest/Southern, 2018

Hail Storms

Rockies & Plains, August 6-7

Tornadoes & Severe Weather

Central & Eastern, July 19-22

Southern & Eastern, April 13-16

Southeastern, March 18-21

Severe Weather

Central & Eastern, May 13-15

Central Northeastern, May 1-4

Hurricane

Hurricane Florence, September 13-16

Hurricane Michael, October 10-11

Winter Storm

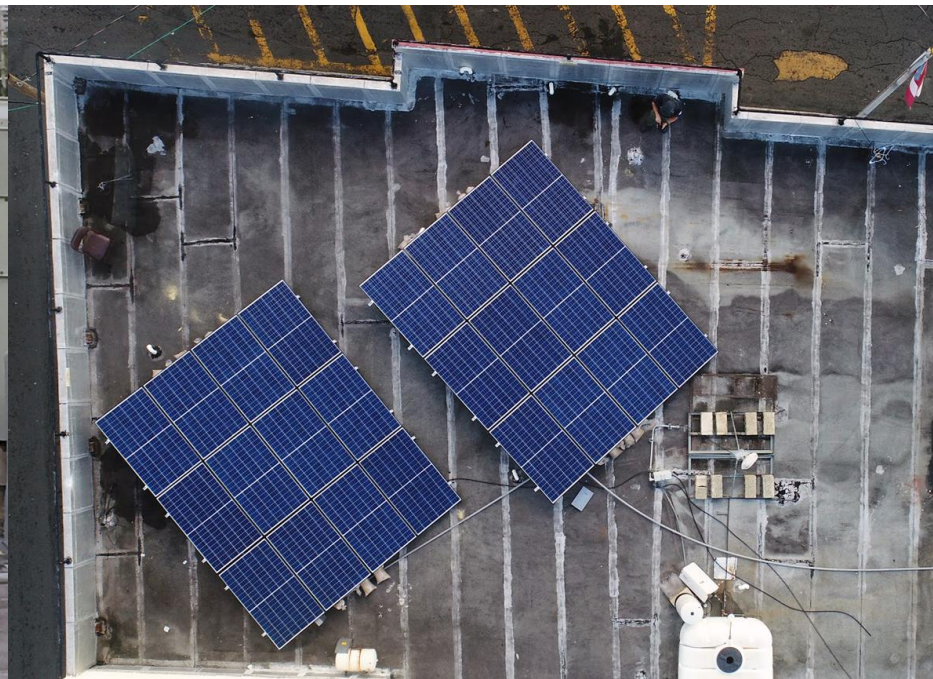
Northeast, March 1-3

Northeastern & Eastern, January 3-5

This map denotes the approximate location for each of the 14 separate billion dollar weather and climate disasters that impacted the United States during 2018.

Puerto Rico: October 11, 2017

Distributed Solar + Batteries Create a More Resilient, Reliable Energy System



Sunrun makes the hard stuff simple

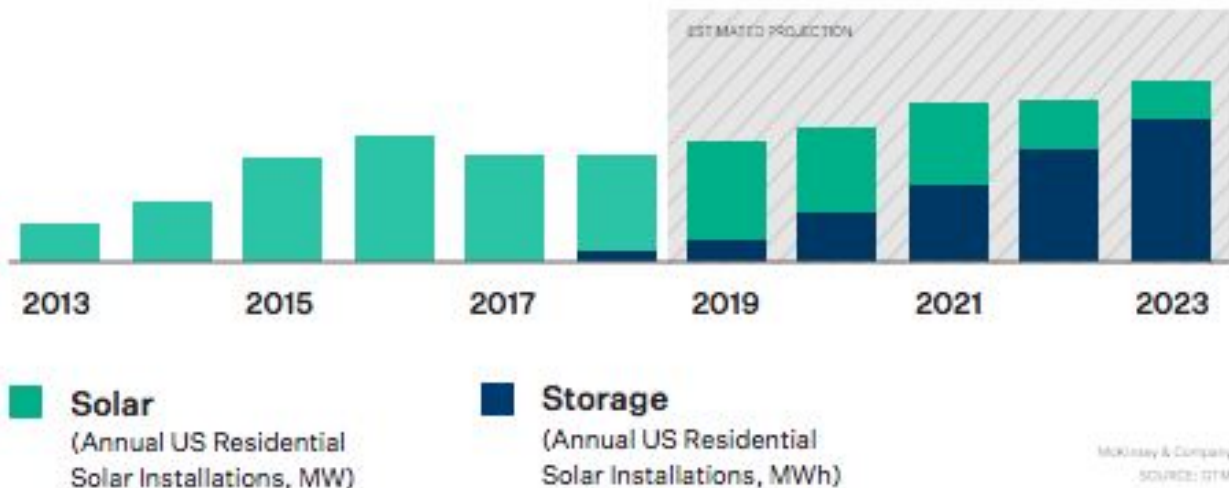
Energy can be complicated, but Sunrun helps you get what you need.

- Sunrun installs, maintains, warrants and insures your entire Brightbox system for the life of your agreement, giving you worry-free solar and battery service for 25 years.
- Systems are exposed to brutal elements over decades— even if something does break, we will fix it. From contract signature through system life, our Care Team is there to provide our customers with all they need.



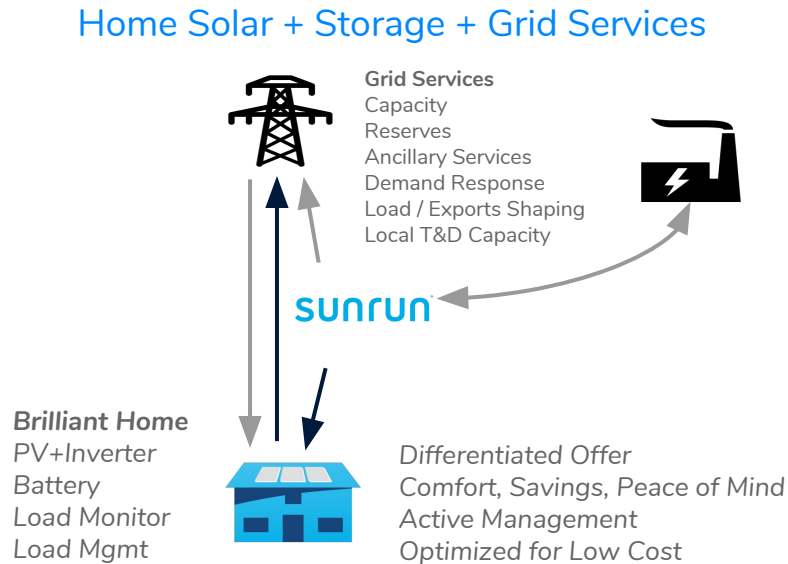
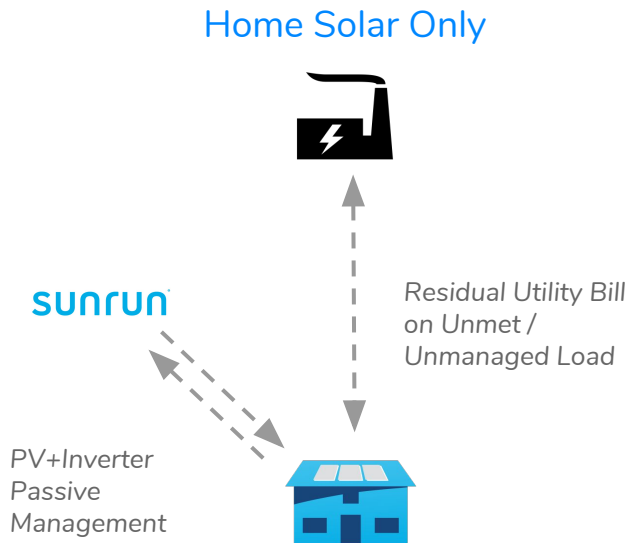
Multiple Benefits of Home Solar & Batteries

Installation of Solar Only vs. Solar and Batteries Growth By Year¹⁴

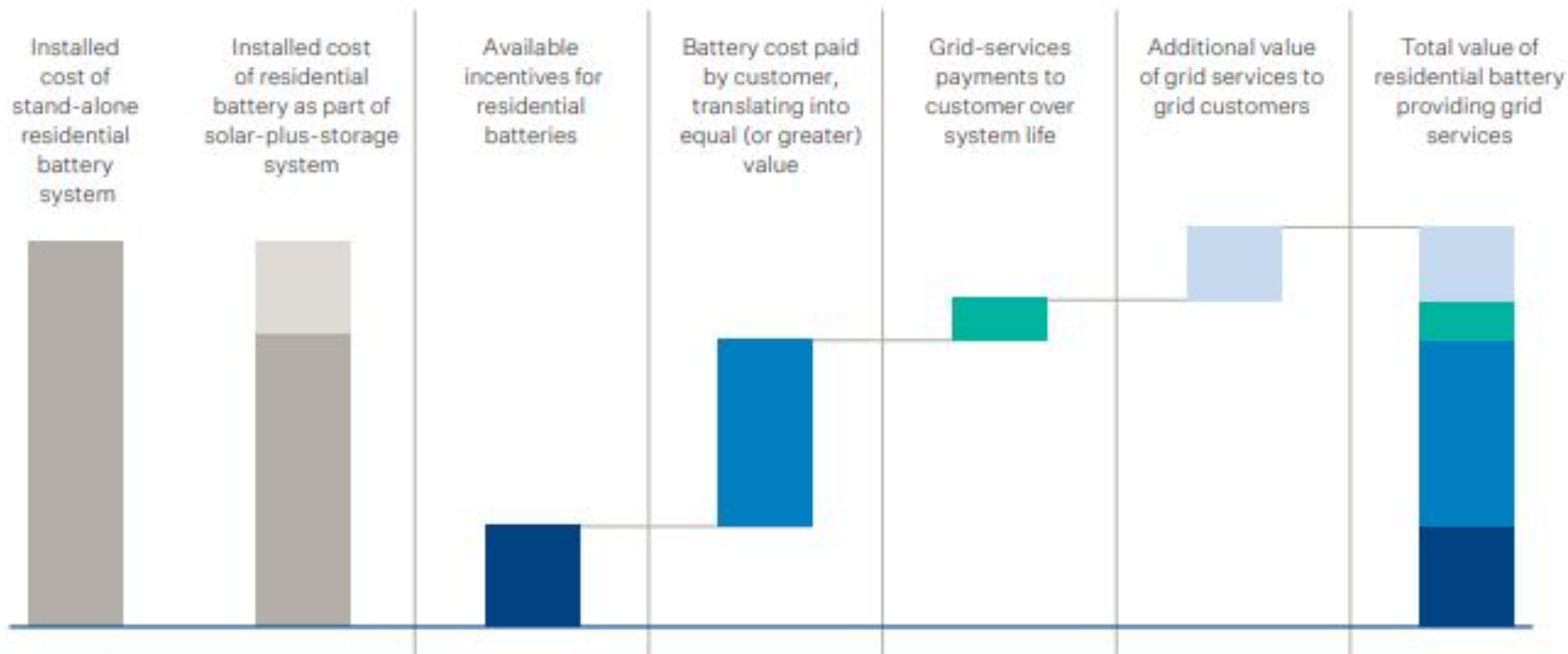


Storage is expected to quickly become a standard component of residential installations.

Multiple Benefits of Home Solar & Batteries



Multiple Benefits of Home Solar & Batteries



Two Paths

Two Potential Futures



A Virtual Power Plant

Reduce impact of “line losses” of 10%+ between gross generation and net electricity sold to customer



Reduce transmission capacity need and susceptibility to contingencies and natural disasters.



Provides clean, cost effective peaking capacity.



A Virtual Solar Power Plant for L.A.? 'It Will Happen'



A Sunrun installer at a customer's home in Carlsbad.
Collin Chappelle for The New York Times



Photographer: Laura Segall/Bloomberg

Climate Changed

Battery-Backed Solar Breaks Into Grid Long Seen Off Limits

By [Brian Eckhouse](#) and [Chris Martin](#)

February 7, 2019, 6:00 AM PST Updated on February 7, 2019, 1:34 PM PST

OPINION // OPEN FORUM

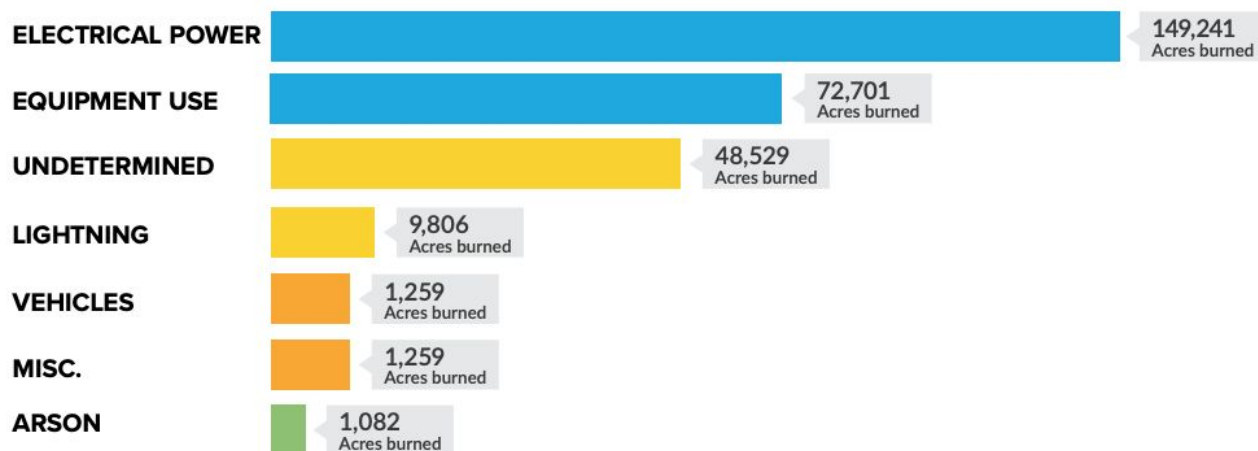
Rooftop solar must be part of California's wildfire mitigation plans

By Anne Hoskins | Nov. 28, 2018 | Updated: Nov. 28, 2018 6:31 p.m.



California Wildfires

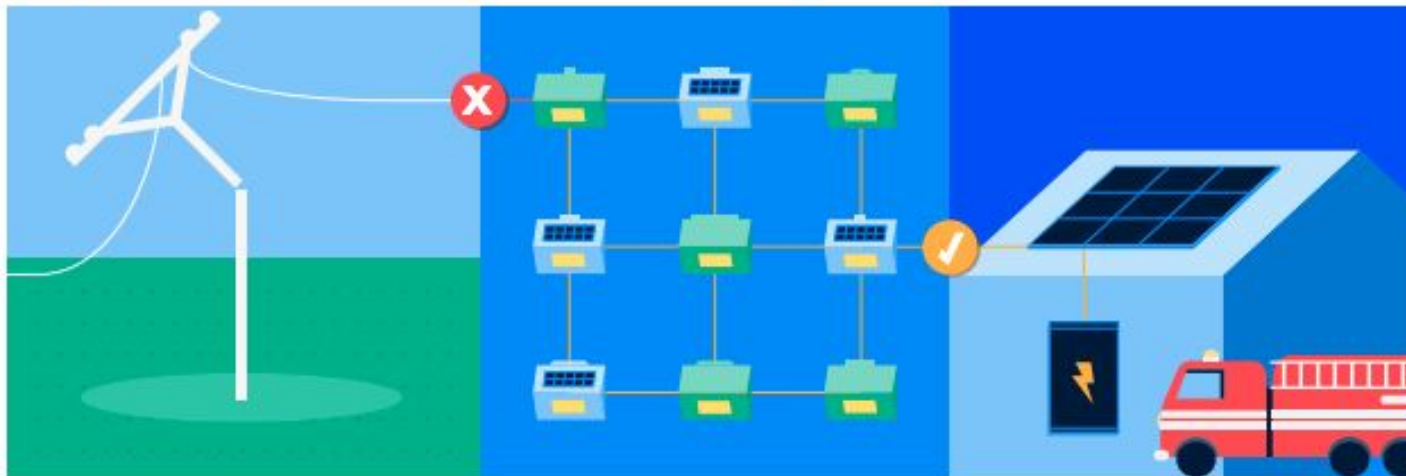
Wildfires sparked by power lines and electrical equipment burned the most acreage in California in 2015, the last year of the reported data.



Source: California Department of Forestry and Fire Protection

California Wildfires

Proposed Solution for Islanding Communities During Grid Outages



By leveraging the capacity of customer-sited resources across the microgrid, a wider range of conditions could be managed, for a longer period of time, without losing power.

California Wildfires



BUYING TIME FOR ENGINEERS

Local solar and batteries can reduce the overall strain on a community's energy infrastructure. This lessens the amount of electricity pulled from the centralized grid, keeping the system within safer tolerances for a longer period of time.



**REDUCE
LOAD**



**RESTORE
CIRCUITS**



**REPAIR
LINES**



**KEEP
LIGHTS ON**

Customer Story: Paul & Debbie McMaster



“The power was only out for about an hour but it gave us the assurance that the Brightbox battery works just like we hoped it would.”

PAUL McMASTER

Recommendations

1. Enable Customer-Driven Energy Transformation by Reforming Utility Incentives
2. Don't Unnecessarily Increase the Cost of Distributed Solar & Batteries
3. Promote Policies that Maximize the Value of Batteries
4. Unlock Solutions, Resilience & Savings for Those Who Are Most Vulnerable



The time for
solar + storage
is now.