Energy Services
Creating a Planet Run by the Sun

Andlinger Center Annual Mtg | Princeton Univ.
November 9, 2019

Audrey Lee, Ph.D.
Vice President, Energy Services
Brightbox: our home solar and battery service

Deployed over 1.7 GW of residential solar to over 255,000 customers.
Installed over 6,000 Brightboxes.
Brightbox represents >10% of all direct sales (25% in California).
Non-export | Time-of-use Rates | Virtual NEM

Solar as a Service | HI Self-Supply | CA Time-of-Use | TX Virtual NEM

Sunrun Energy Services Platform

Back-up
Residential continues to grow, Largest segment in Q2 2019

- Resi Q2 2019: 34.8 MW | 79.2 MWh
- ~3 million homeowners have already invested in standby generators with higher cost / disadvantages vs. energy storage
- Pairing with solar enhances value and enables distribution through resi solar
- Wood Mackenzie projects customer-sited storage will make up 40% of storage market (in MW) and 47% (in $) in 2024.
Customers want reliable and resilient energy

**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.
Public Safety Power Shutoffs (PSPS)

- **Nov 2018**: Camp Fire - Deadliest and most destructive fire in California history.
- **Jan 2019**: PG&E Files for Bankruptcy - In anticipation of legal and financial fallout from Camp and Tubbs fires, PG&E files for bankruptcy protection.
- **Sept 2018**: SB 901 - Governor Brown signs SB 901, protecting PG&E from financial liability for 2017 fires. Requires utilities to submit Wildfire Mitigation Plans to the CPUC.
- **Oct 2017**: Tubbs Fire - Most destructive wildfires in California history.
- **May 2019**: CPUC Approves PG&E PSPS Strategy - CPUC approves PG&E wildfire plans that outline widespread impacts of calling for PSPS event.

*In May, CPUC approved proactive de-energization of power lines in times of high wind, but only "as a measure of last resort."*
October 2019

Millions of Californians are impacted by proactive power safety shut offs (PSPS) events as fire seasons intensifies. Unprecedented loss of power:

- Oct. 3rd, PG&E turns off power for **nearly 800,000 customers in 35 counties for 3 days**
- Oct. 27th, historic outage event leaves **1.3 million in Bay Area** and additional customers in SCE without power.
- Fire season continues without rain in the forecast for weeks.
With scale the cost of technology declines

This graph compares the historical and future cost to deliver a kilowatt-hour of electricity to a residential customer from rooftop solar, rooftop solar paired with energy storage, or from the grid in Hawaii, California and Texas. When all-in delivery costs are considered, the trend towards cost advantage of distributed resources becomes clear.²

Source: https://www.sunrun.com/home-solar-blog/solar-industry-insights/we-can-decarbonize-rapidly
....but the cost to deliver is increasing

By 2030, the electric utility industry will need to make a total infrastructure investment of $1.5 to $2.0 trillion
We must decarbonize and we can (without stranded assets)

Edison Electric Institute Study:
70% believe 100% of our electricity should come from renewables
51% believe 100% renewables is a good idea even if it raises their bills by 30 percent
Partnerships with Utilities/Grid Operators

**MARKETS**

**INVESTOR OWNED UTILITIES**

**MUNI, CCA**

**SUNRUN ENERGY SERVICES PLATFORM**
Bring Your Own Device and Coordinated Export

**INVESTOR OWNED UTILITIES**
- National Grid
- PSEG Long Island
- Hawaiian Electric

**MARKETS**

**MUNI, CCA**

**SUNRUN ENERGY SERVICES PLATFORM**

[Diagram showing various energy-related components and processes related to energy services and platforms.]
Evolve rules for fossil-fueled power plants, Replace them
Give voters an alternative to backyard power plants

**Investor Owned Utilities**
- National Grid
- Green Mountain Power
- PSEG Long Island
- Hawaiian Electric

**Markets**
- ISO New England

**Muni, CCA**
- East Bay Community Energy
- Glendale Water & Power

**Sunrun Energy Services Platform**
Scaling Across the Country: BYOD and Islands
Scaling: Competitive Market Rules

**INVESTOR OWNED UTILITIES**
- National Grid
- PSEG Long Island
- Liberty Utilities
- Puerto Rico Electric Power Authority
- Eversource

**MARKETS**
- ISO New England
- PJM
- California ISO

**MUNI, CCA**
- Glendale Power & Water
- East Bay Community Energy

**SUNRUN ENERGY SERVICES PLATFORM**
Virtual power plant with rooftop solar and batteries

- By 2030, fleet of 150,000 homes and 5,000 apartments with rooftop solar, from 36,000 homes today
- 75,000 homes equipped with solar + batteries can generate ~300 MW peaking capacity, equivalent to a gas power plant
- www.sunrun.com/cleanenergyla
Scaling: Eliminating Power Plants

**INVESTOR OWNED UTILITIES**
- National Grid
- PSEG Long Island
- Liberty Utilities
- Eversource
- Hawaiian Electric
- Puerto Rico Electric Power Authority

**MARKETS**
- ISO New England
- California ISO
- ISO New York Independent System Operator

**MUNI, CCA**
- Glendale Water & Power
- LA Department of Water and Power
- CPA Community Alliance
- Peninsula Clean Energy
- East Bay Community Energy
- Silicon Valley Clean Energy

**SUNRUN ENERGY SERVICES PLATFORM**

BACK-UP
Battery Sharing Economy for Customer & Grid

**Investor Owned Utilities**
- National Grid
- PSEG Long Island
- Liberty Utilities
- Puerto Rico Electric Power Authority
- Eversource

**Markets**
- ISO New England
- PJM
- California ISO
- New York Independent System Operator

**Muni, CCA**
- Glendale Water & Power
- LA DWP
- CPA Clean Alliance
- Silicon Valley Clean Energy
- East Bay Community Energy
- Peninsula Clean Energy
- MCE

**Sunrun Energy Services Platform**
The opportunity
Thank you!
www.sunrun.com/grid-services

Memory Lane
- Steve Lyon Lab
- Circa 2002
- Attempt to measure electron spin lifetime in quantum dots