

Solar Goes Corporate 101

Where Clean Energy Buyers
and Providers Converge



Agenda

- About SEIA, Solar Goes Corporate and Solar Means Business
- Commercial Solar Has Arrived
- Ranking America's Top Corporate Users
- Trends in Corporate Solar Adoption
- Looking Forward
- Solar and Storage for Commercial Customers
- What to Expect at Solar Goes Corporate 2019

About SEIA

The Solar Energy Industries Association (SEIA®) is the driving force behind solar energy and is building a strong solar industry to power America through advocacy and education. As the national trade association for the U.S. solar energy industry, which employs more than 242,000 Americans, we represent all organizations that promote, manufacture, install and support the development of solar energy. SEIA works with its 1,000 member companies to build jobs and diversity, champion the use of cost-competitive solar in America, remove market barriers and educate the public on the benefits of solar energy.

Our Work



Government Affairs



Communications



Market Research



Events & Education



Industry Leadership

Solar Goes Corporate 2019

SEIA's Solar Goes Corporate is the leading forum to discuss and learn how businesses can effectively procure, deploy, and invest in clean energy technologies such as solar, battery storage, and energy efficiency. This is a unique opportunity to meet with over 200 leaders from across clean energy industries and the business community to discuss critical trends, challenges and solutions relating to expanding commercial use of clean energy.

2019 Topics Include:

- **Navigating Renewable Sourcing Options & Understanding Customer Needs**- Kick things off with an interactive game session to dissect the range of clean energy options available to large and small companies.
- **Stories of Innovation** - Hear from Organic Valley and Dr. Bronner's about their energy transition journeys intersected, the challenges they encountered along the way and the need for flexibility in executing a successful renewable energy strategy.
- **Storage Goes Corporate: Maximizing Value and Minimizing Risks** - Discover how companies can increase value, reduce risks and streamline energy usage with hybrid solar + battery storage projects and stand-alone storage projects.
- **Maximizing the Value of Your Energy Transition** - Learn about the business case for pollinator-friendly solar sites and how sophisticated energy buyers view the intersection between energy, brand and business.

About Solar Means Business

Solar Means Business tracks U.S. solar photovoltaic (PV) installations that support commercial activities at U.S. facilities.

- The report focuses on America's largest companies, but includes available data for companies of all sizes
- Systems can be located on-site and provide electricity to the facility directly, or off-site and offset electricity costs for a company through virtual net metering or similar financial relationship
- Both company-owned and third party-owned (PPA or lease) systems are included
- Report covers commercial systems **installed by the end of 2018**

This is the **7th annual edition** of this report. You can find previous versions at www.seia.org/solar-means-business-report

This report **does not capture data on every commercial solar installation in the U.S.**, but every attempt has been made to ensure that the solar portfolios of America's largest corporate users are accurately represented.

- Rankings and analysis are based on **system-level data for over 35,000 commercial solar PV systems**
- Data in **this report captures nearly 70% of all U.S. commercial solar capacity** through the end of 2018
- Previous versions of this report only tracked on-site installations. **For the first time, this edition tracks off-site projects** as well, capturing a growing trend in commercial solar procurement.

Data comes from a variety of sources:

- Directly from the system owners or hosts
- From installers, with permission of system owners or hosts
- From publicly available data sources such as state regulatory bodies, press reports and research reports

All data in this report can be cited to SEIA *Solar Means Business 2018*, unless otherwise noted.

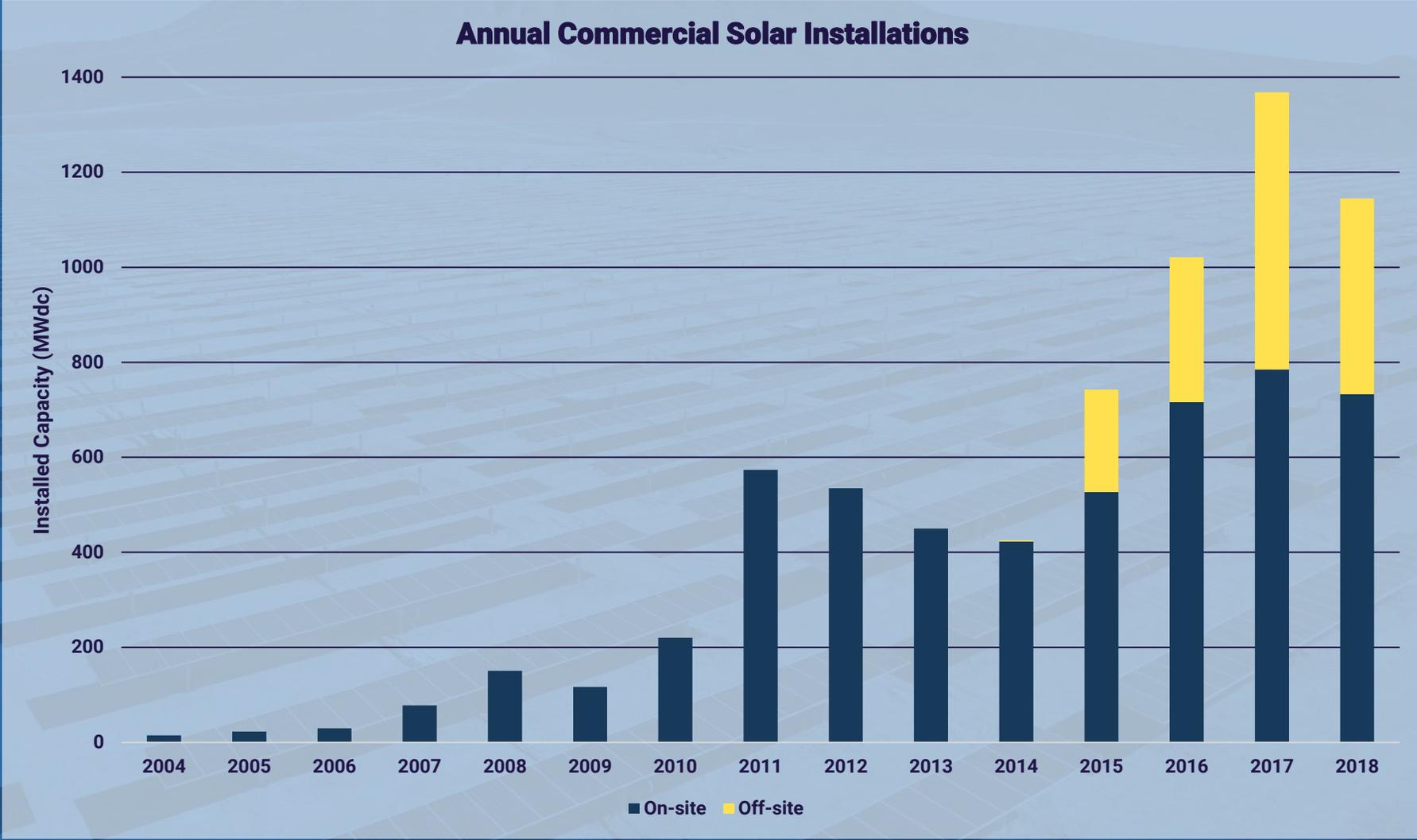


Commercial Solar Has Arrived

How'd we get here? Where are we going?

Commercial Solar Installations Have Spiked in Recent Years

- More than half of all commercial solar capacity has been installed in the last 3 years
- 3 of the last 4 years were the largest on record
- 2018 installations are 2.5 times the amount installed 5 years ago and 8 times the amount installed 10 years ago
- With more than 7 gigawatts (GW) installed across 35,000 installations, total **corporate solar deployment is 23 times larger today than it was a decade ago**



Led by Corporate Demand, Falling Prices

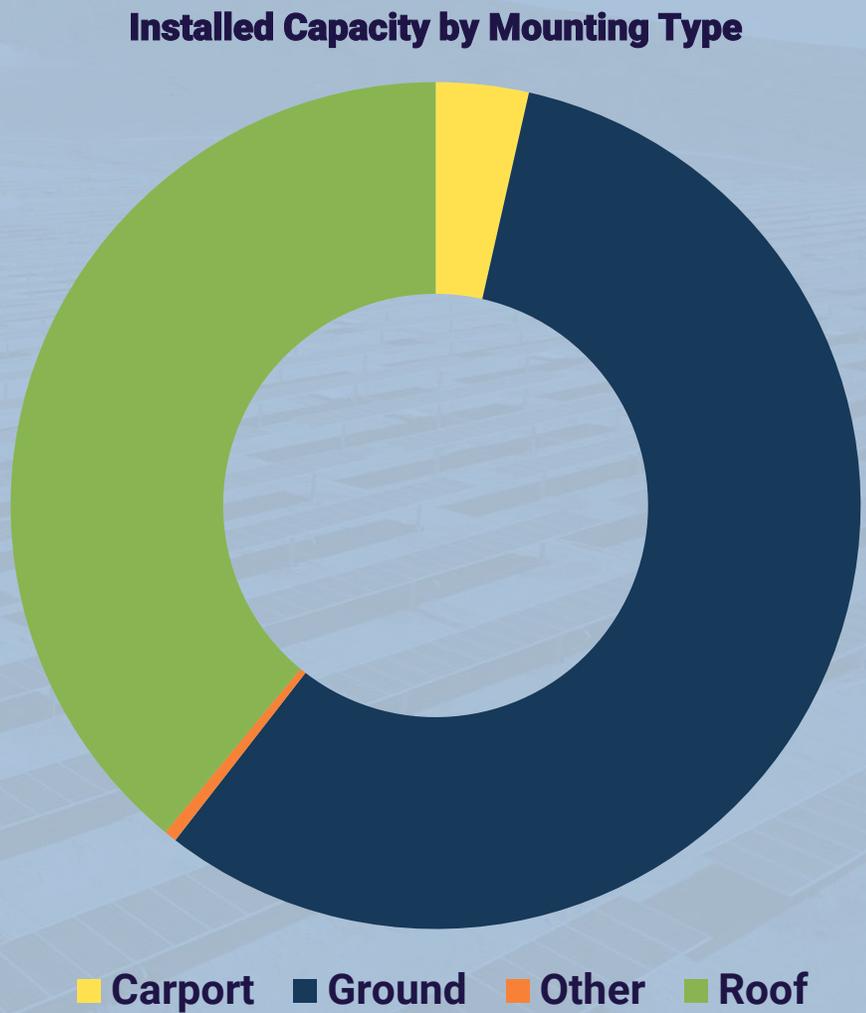
Top 10 Corporate Solar Users

1		Apple	393.2 MW
2		Amazon	249.8 MW
3		Target	229.7 MW
4		Walmart	208.9 MW
5		Switch	179.0 MW
6		Google	142.9 MW
7		Prologis	126.3 MW
8		Kaiser Permanente	120.3 MW
9		Solvay	81.4 MW
10		Fifth Third Bank	80.0 MW

- Over 25,000 U.S. companies have now installed at least 1 solar PV system
- 188 companies have now signed the RE 100 commitment, including at least 30 featured in our Solar Means Business Report. 37 new companies signed in 2018 alone.
- Announcements have continued in 2019:
 - Google: 1.6 GW of new renewables globally, with 720 MW from U.S. solar
 - Starbucks: 216 MW of new U.S. renewables, with 166 MW from solar
 - Facebook: 729 MW of new U.S. solar, directly investing in 379 MW
- Growth in corporate solar demand has been led primarily by declining prices, which have **fallen by 63% over the last decade.**
- In many places in the country, solar is the cheapest electricity option

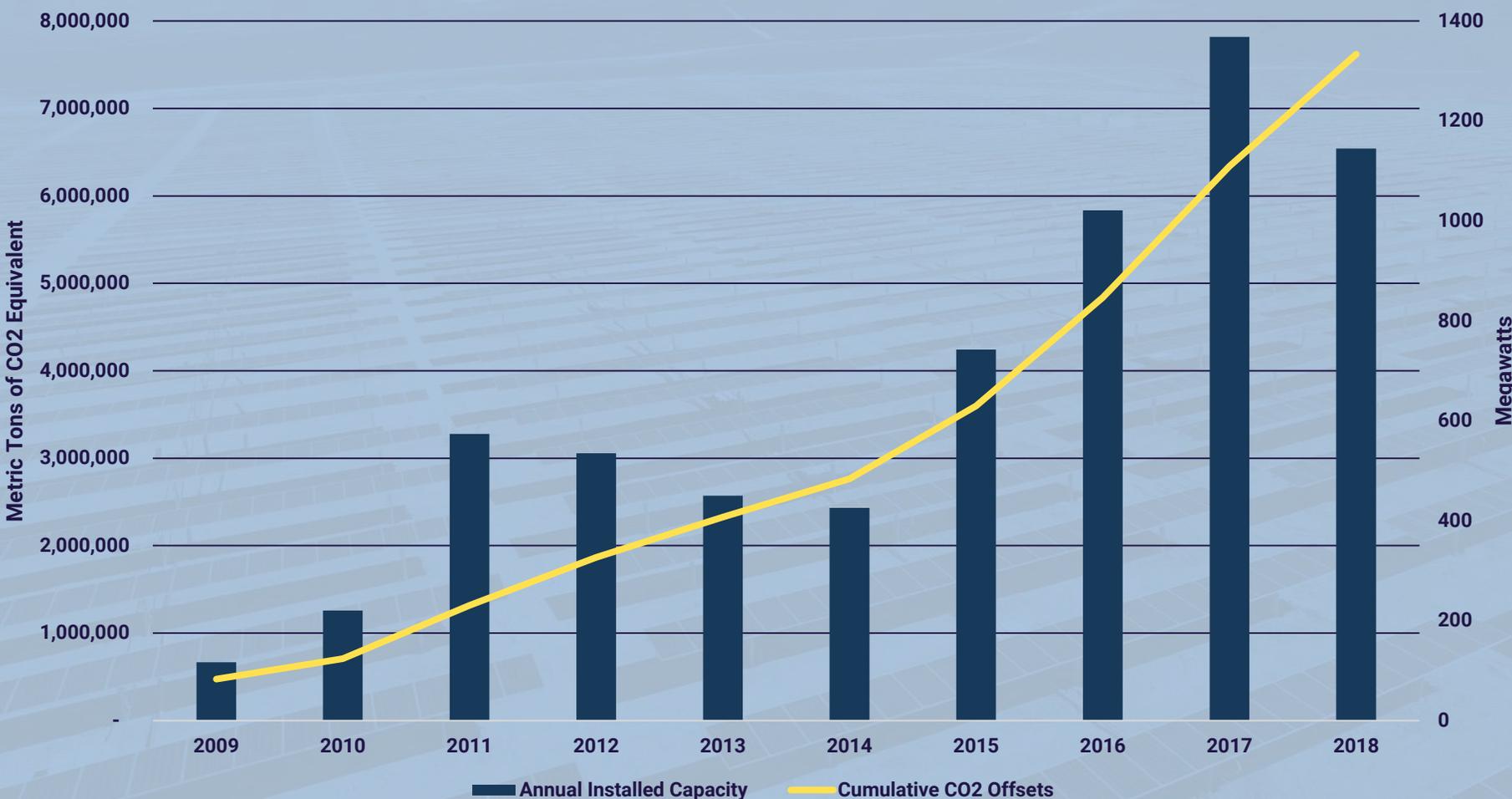
Enabled by Growing Diversity of Solar Energy Solutions

- Mounting Options
 - Ground
 - Rooftop
 - Carport
 - BIPV
- Finance/Procurement Options
 - Ownership
 - PPA/Lease
 - Tax Equity
 - CFD
 - Green Tariff
 - Community Solar
 - PACE
 - RECs
- Additional Options
 - Storage



Benefitting Companies and Communities

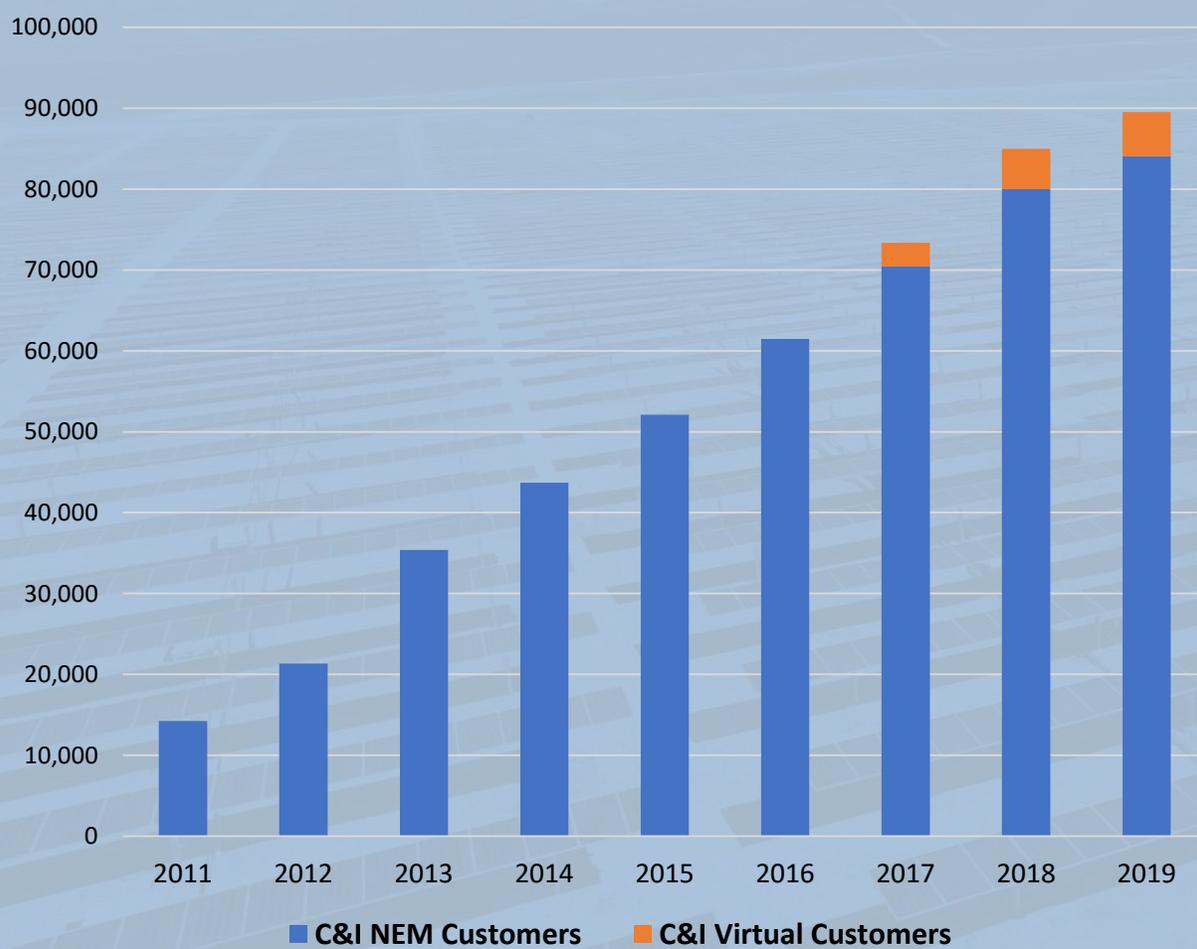
Carbon Dioxide Offsets from Commercial Solar Capacity



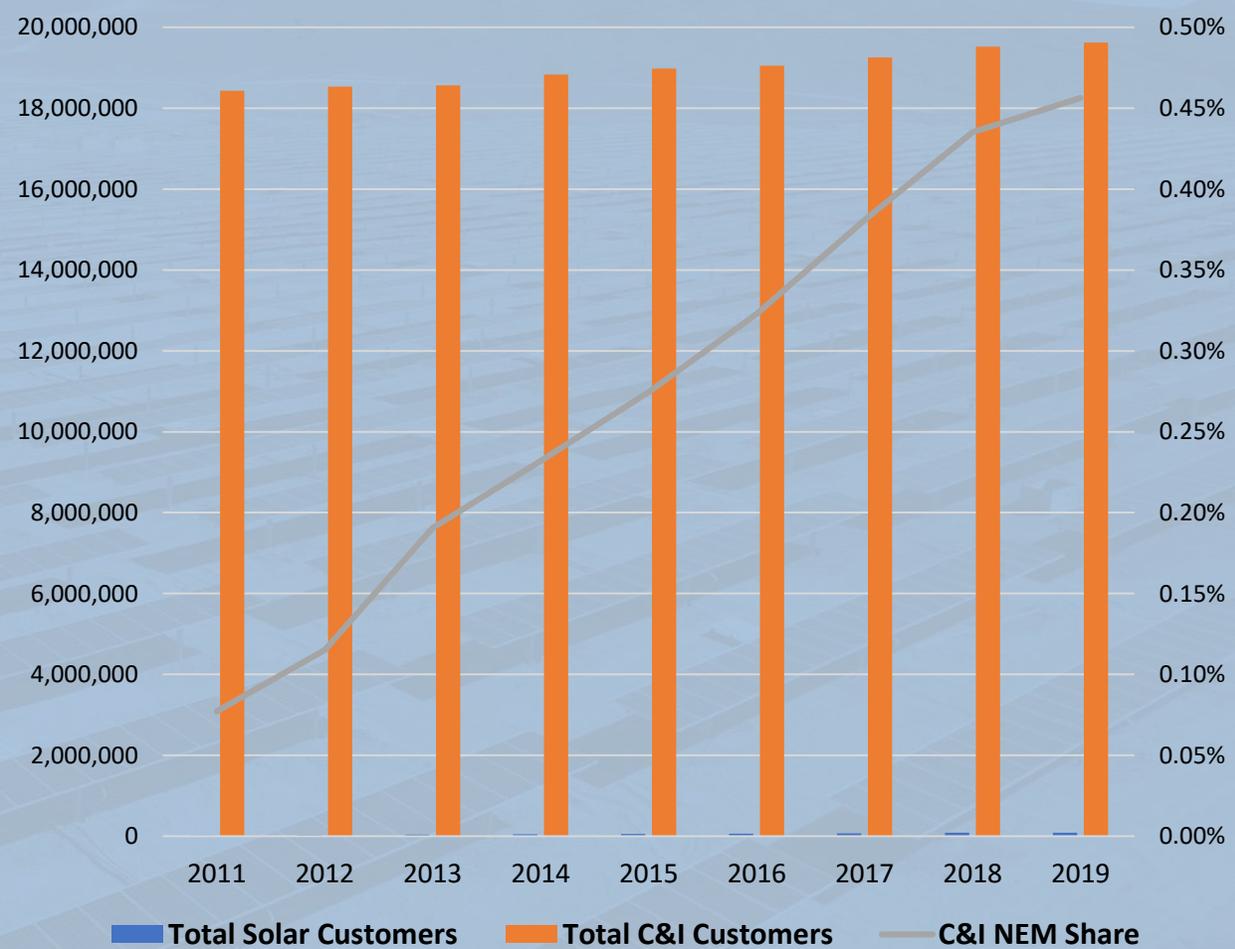
- The systems tracked in Solar Means Business generate **10.7 million megawatt-hours of electricity annually**, enough to power 1.4 million homes.
- Electricity generation from the solar installations tracked in this report offsets more than 7.6 million metric tons of CO2 emissions annually, equivalent to taking 1.6 million cars off the road or planting 126 million trees
- Just the top 25 companies featured in our Solar Means Business Report employ 4.2 million Americans

Room for Growth

C&I NEM Customers



C&I NEM Market Penetration

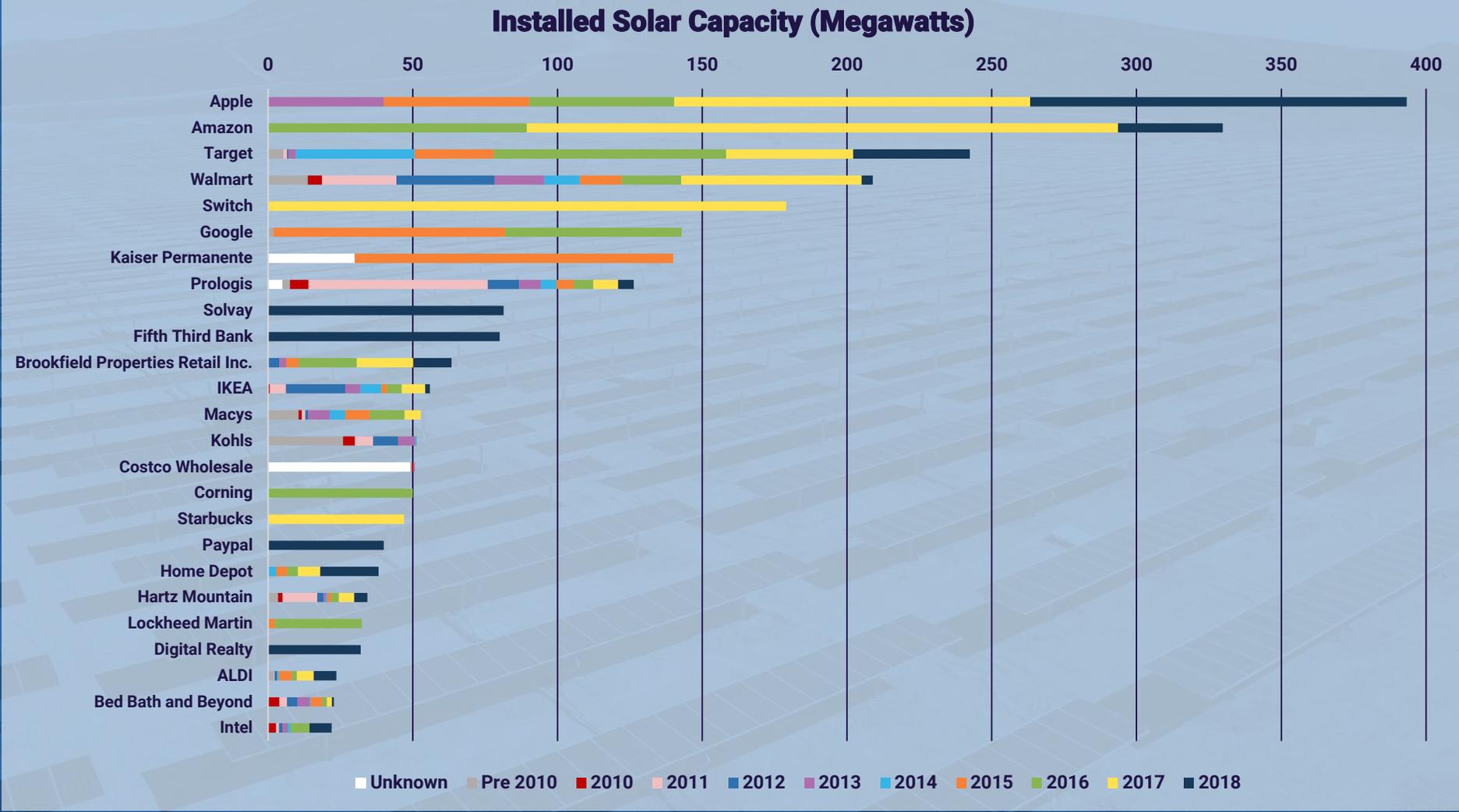


America's Top Corporate Solar Users

Businesses leading the way on solar adoption

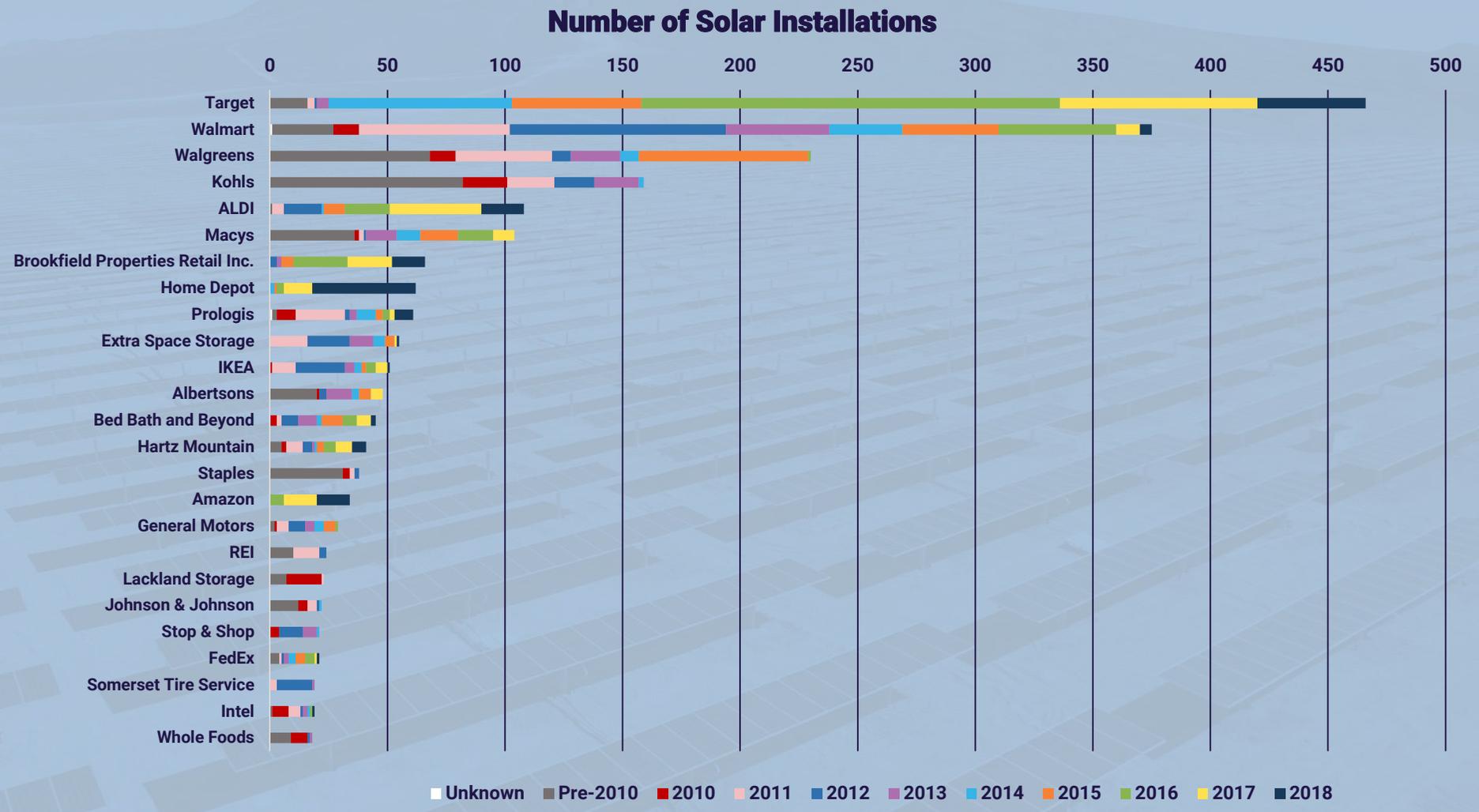
Top 25 Corporate Users by Total Installed Solar Capacity

- Counting both on-site and off-site capacity, Apple takes the top spot with 393 megawatts (MW) of solar installed, marking the first year a company in the tech space sits atop the leaderboard.
- With its mixture of installations on Fulfillment Centers and several large off-site projects in Virginia, Amazon takes second place.
- Former champions Target and Walmart continue to increase their solar investments and remain in the top 5, followed by data center builder Switch with 179 MW of off-site solar in Nevada.
- 15 of the top 25 corporate solar users are part of the Fortune 500 rankings, along with 30 of the top 50



Top 25 Corporate Users by Number of Solar Installations

- Target and Walmart continue to pace the field for number of individual solar installations.
- Fellow retailers Walgreens, Kohl's and Macy's round out the top 5, making use of their hundreds of rooftops nationwide.
- Most companies on this list utilize mid-sized rooftop systems to achieve their solar goals, in contrast to the large ground-mounted systems used by companies at the top of the overall rankings.

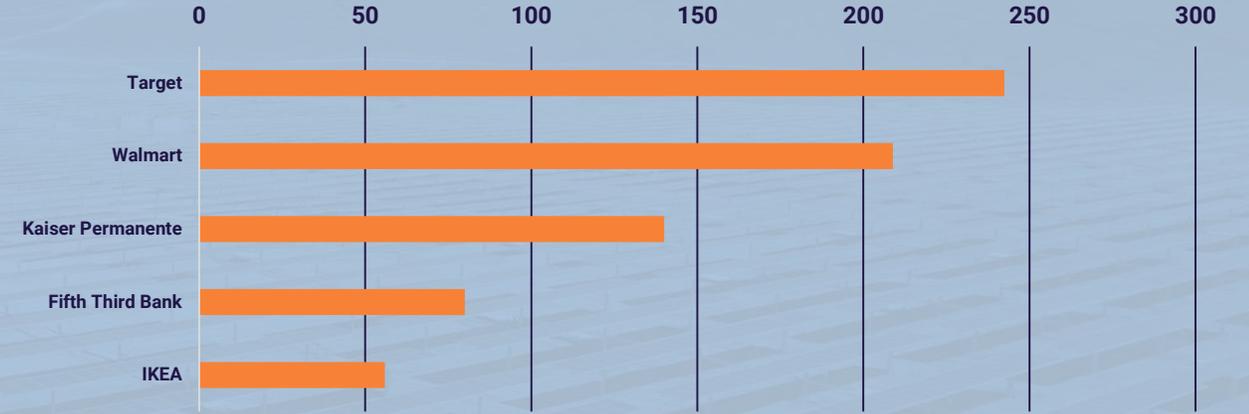


Top 5 Corporate Users by Industry (MW Installed)

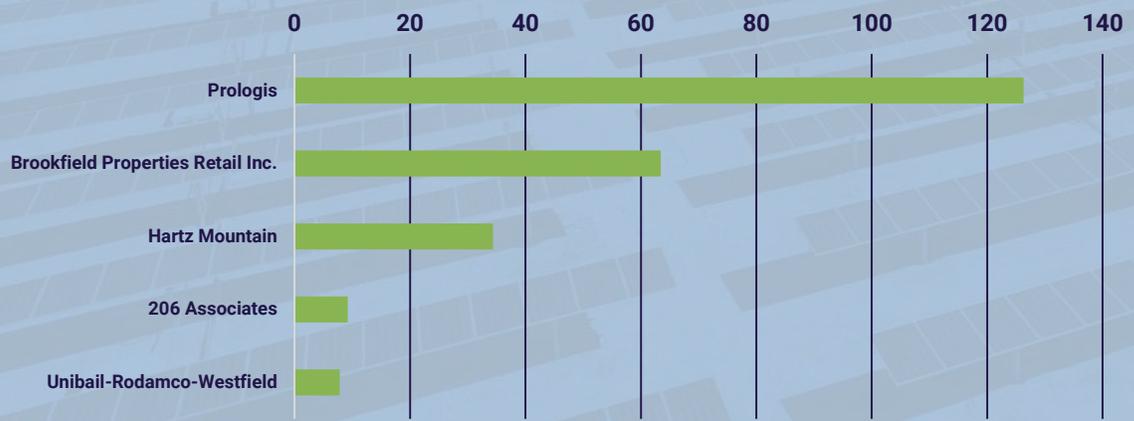
Manufacturing



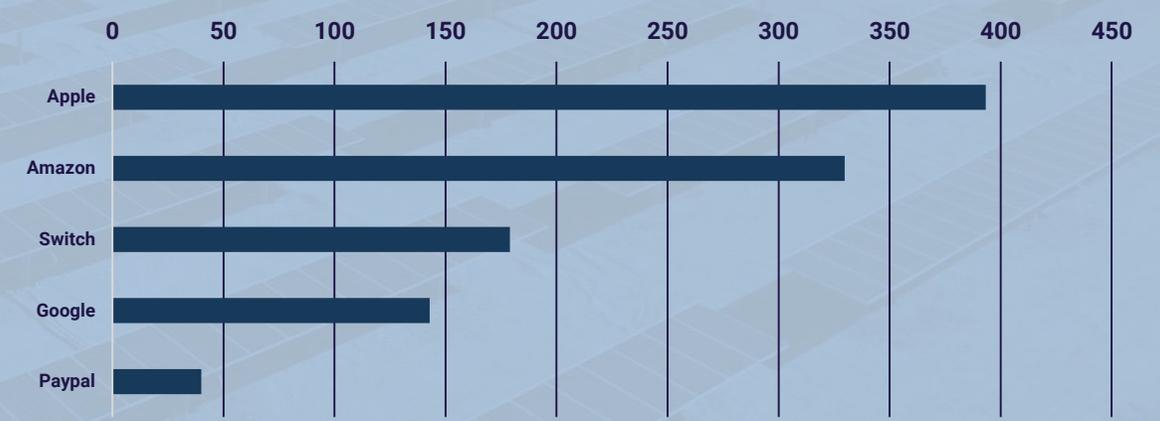
Retail/Service



Real Estate



Tech

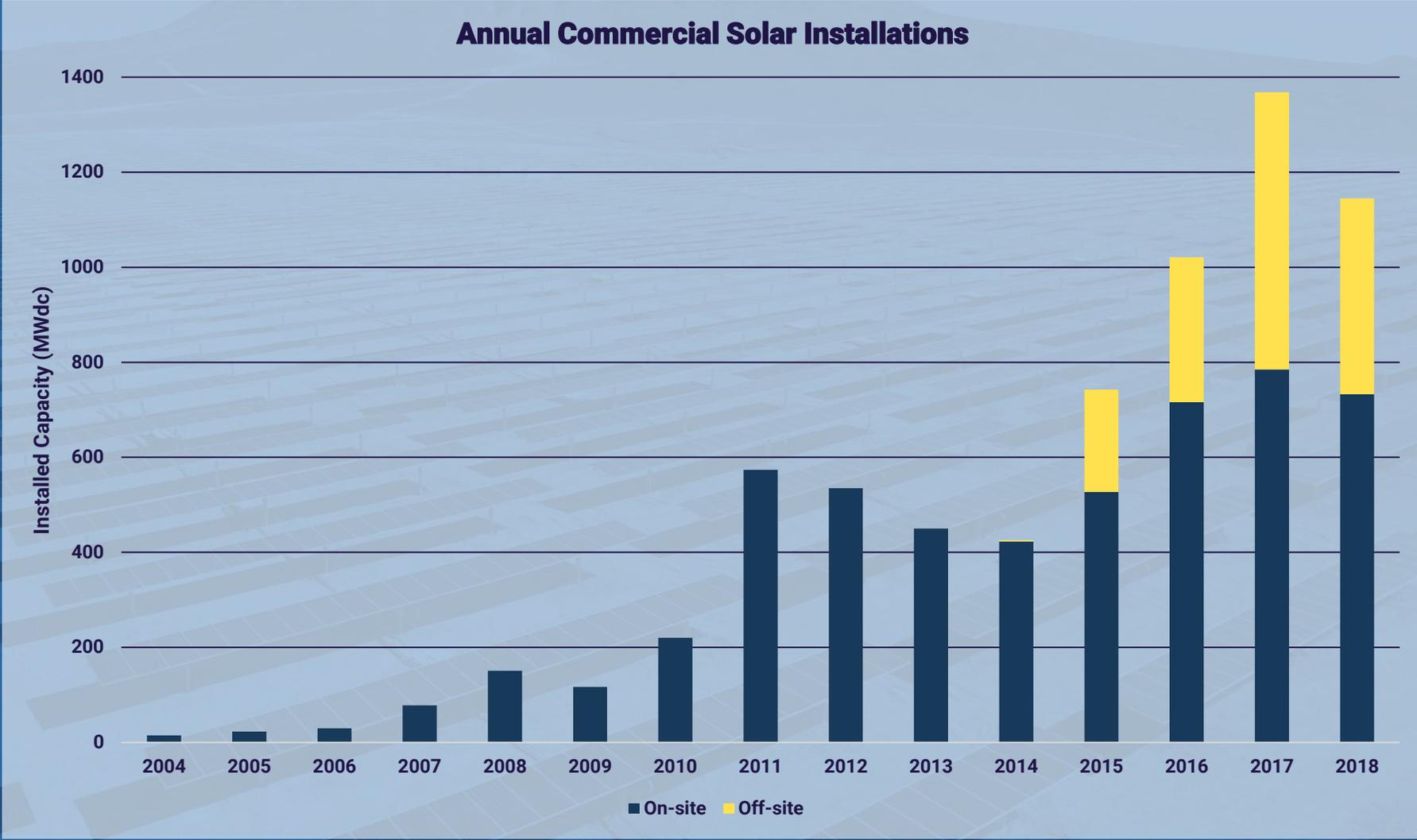


Trends in Corporate Solar Procurement

Keeping tabs on the most dynamic, fast-changing market in solar

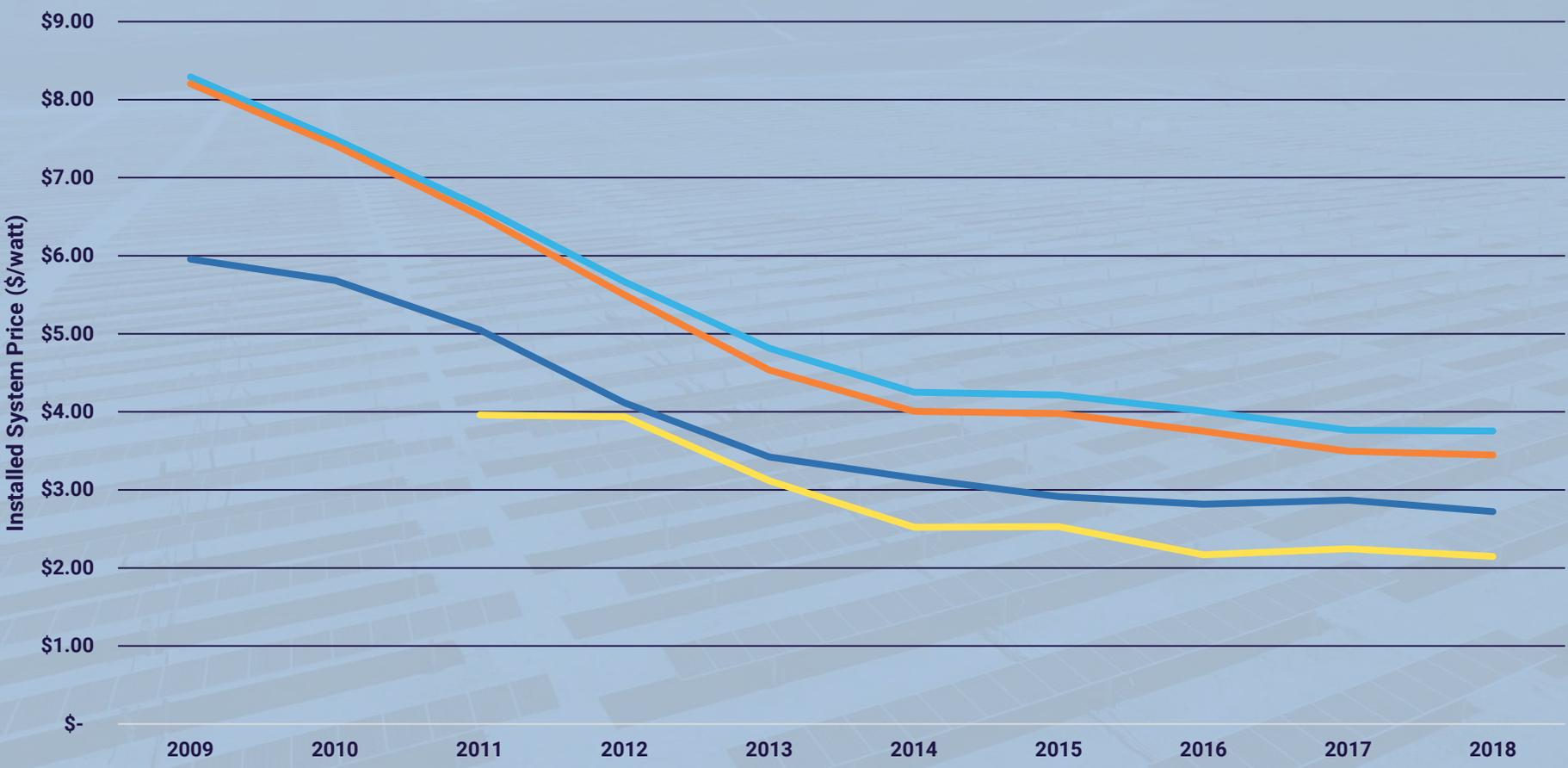
Commercial Solar Installations Have Spiked in Recent Years

- After mixed growth in the early part of this decade, corporate solar adoption has surged over the past several years, with more than half of all capacity installed since 2016. The 1,144 MW installed in 2018 is second to only 2017 for annual commercial deployment.
- Falling prices and more flexible procurement options have led to rapid growth in off-site adoption, which made up more than 1/3 of all commercial solar deployment in 2018.
- Demand pull-in from upcoming changes to rate structures and incentives in major state markets drove on-site procurement in 2017 and the early part of 2018. The transition has led to slower growth over the last 12 months, but installs are expected to pick back up due to falling prices and demand pull-in from the step down of the solar Investment Tax Credit (ITC).



Commercial Solar Prices Continue to Decline

Average Commercial System Price by System Size for On-Site Projects



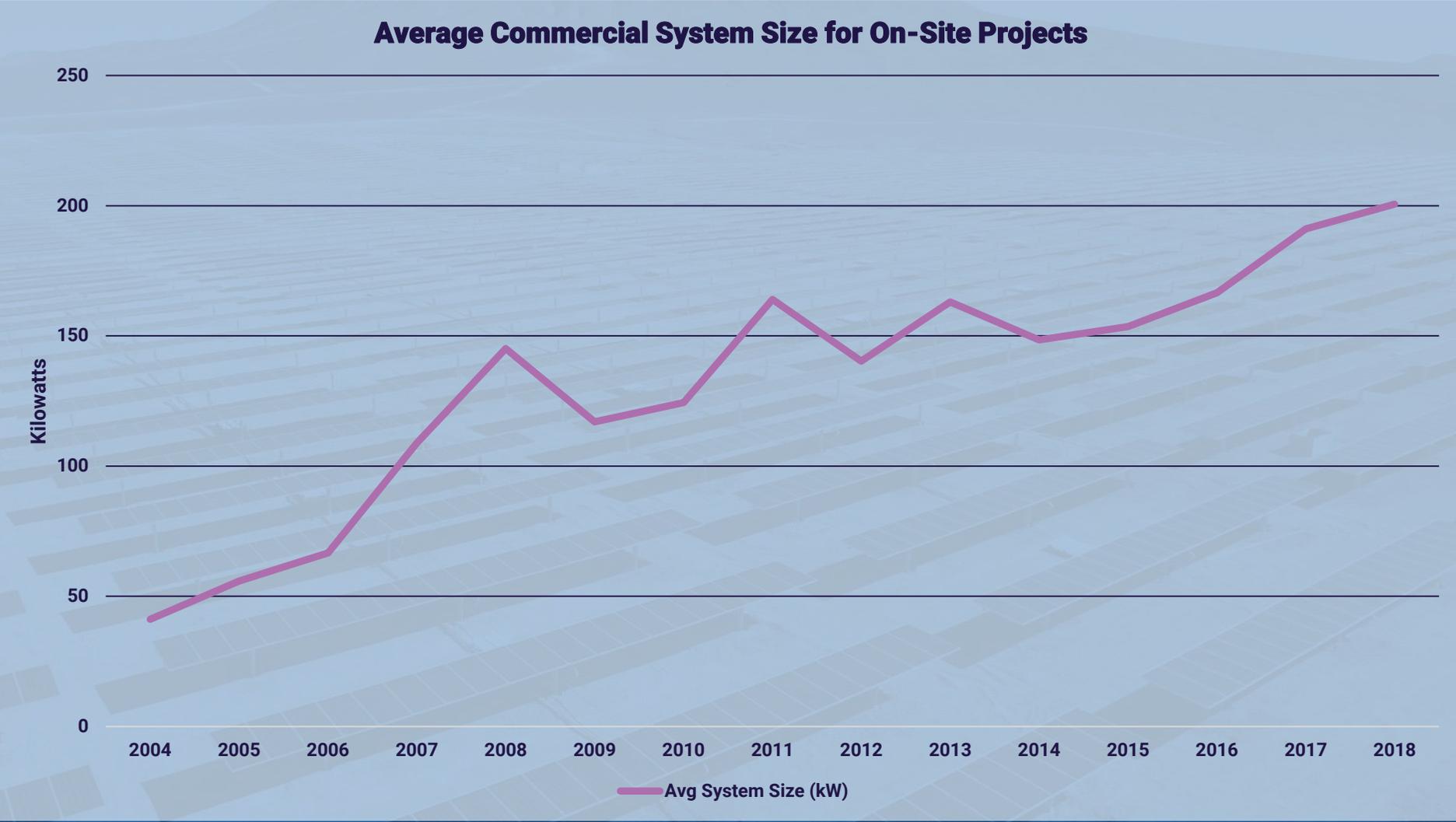
Note: System prices come primarily from CA, NY and MA and do not reflect pricing in all states. National average price quotes for a 100 kW system in Q1 2019 were \$1.47/watt.

Legend: <100 kW (light blue), 100 kW - 1 MW (dark blue), 1 MW+ (yellow), Average (orange)

- Based on the data collected for this report, the price to install an on-site commercial system has dropped by nearly 63% over the past decade. Similar price declines are seen across all system sizes.
- Price declines have been driven by reductions in the cost of panels and other hardware, but also by improvements in labor efficiency and company overhead as markets become more competitive.
- Tariffs on imported panels have slowed price declines since their announcement in 2017, driving domestic module prices \$0.12 - \$0.13/watt higher than global prices.

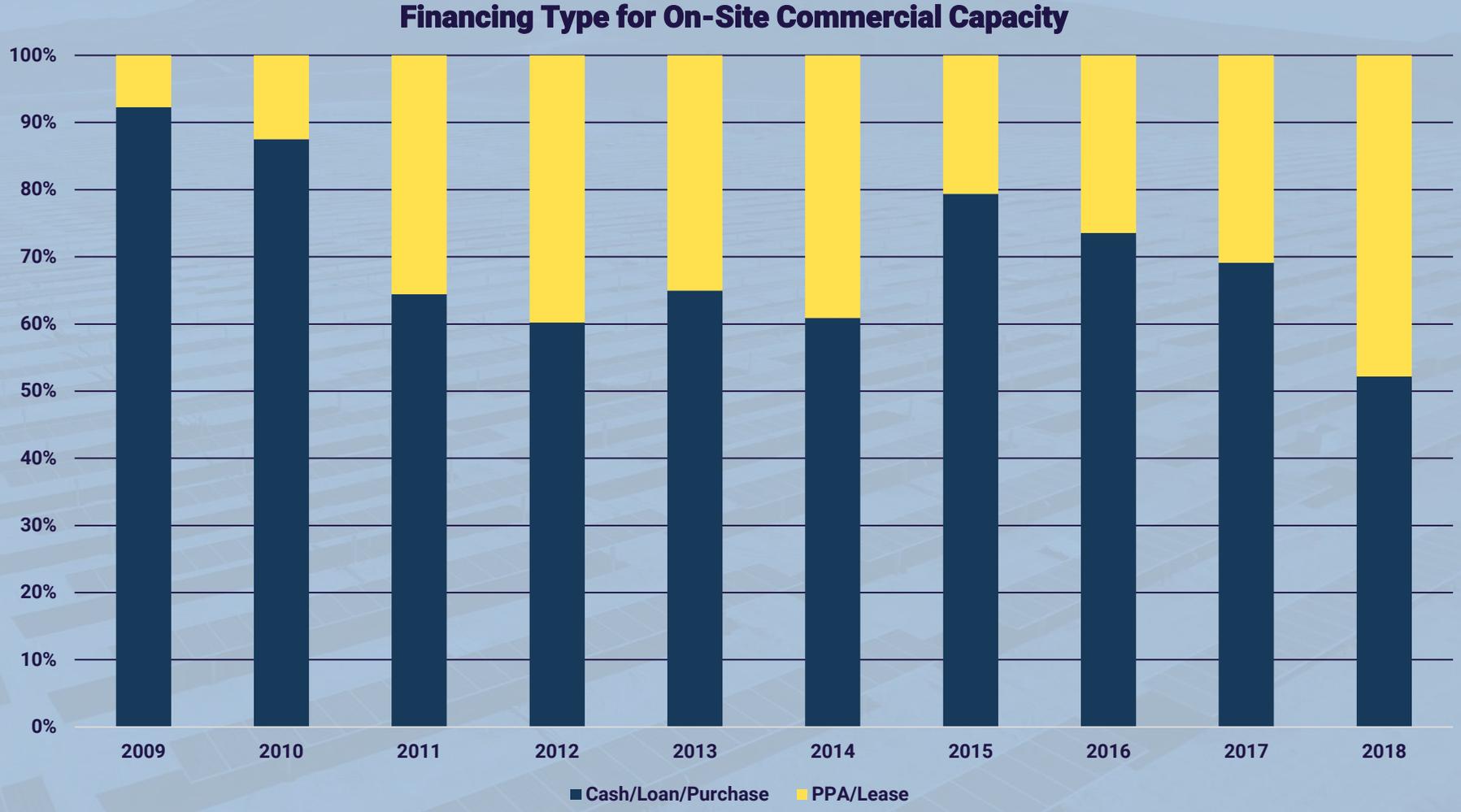
Commercial System Sizes Increase as Prices Fall

- Average commercial system sizes for on-site projects climbed above 200 kW for the first time in 2018.
- Growth in system size is primarily due to falling prices, allowing companies to install more capacity for the same amount of money.
- The growth of third-party financing has also given companies more financial flexibility to make larger solar investments with less up-front capital.
- As prices come down, and corporations increase their renewables goals, we expect this growth to continue.



Third Party Ownership Grows Sharply in 2018

- Development models for on-site commercial solar PV systems generally take one of two forms: direct ownership, or third-party ownership (TPO), generally executed through the use of a [Power Purchase Agreement \(PPA\)](#)
- Even as TPO has declined in the residential market due to falling prices and a growing portfolio of loan options, PPAs continue to increase their share of the commercial solar market. The low upfront investment, limited risk and predictable long-term electricity rates offered by PPAs tend to offer more value to businesses relative to homeowners.
- In 2018, 47% of on-site commercial capacity tracked in this report used a PPA, up from 31% in 2017.
- Companies wishing to retain the SRECs from their system to meet internal environmental goals likely sets a ceiling on the growth of PPAs in the commercial market.



Rapid Growth in Off-site Commercial Solar



- This year's report tracks off-site commercial solar for the first time, an area of rapid growth.
 - Since 2014, at least 31 off-site corporate solar projects have been completed, with a total capacity of 1.5 GW, representing a third of total commercial capacity over that time period.
 - Over the last 18 months, nearly 4 GW of new corporate off-site projects have been procured, with **annual procurements of 2 GW expected over the next several years.**
 - Annual deployment of off-site corporate solar is expected to hit 1 GW in 2020, and increase in proportion to future procurement expectations.
- These projects allow companies to tap into economies of scale by siting projects in areas where larger system sizes are possible.

Source: SEIA/Wood Mackenzie Power & Renewables, *U.S. Solar Market Insight*

Rapid Growth in Off-site Commercial Solar

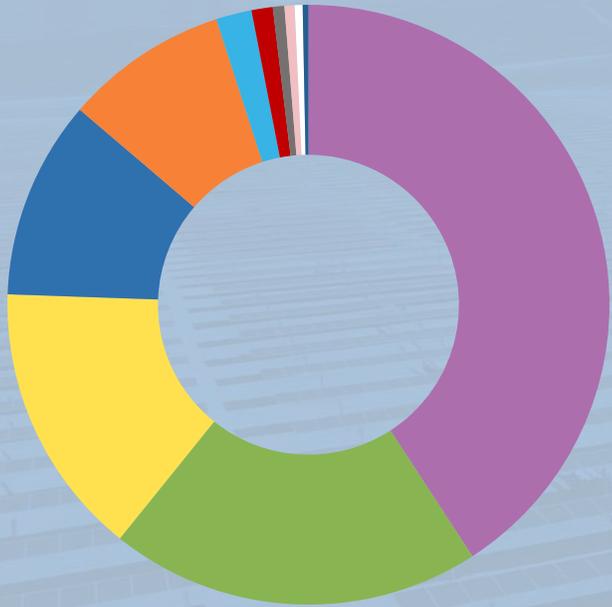
- Projects also benefit from multi-party financial arrangements in which multiple companies buy a share of the generation from a single project.
 - Enabled by physical PPAs (in which the corporate buys and takes legal title for the electricity from a system) and virtual PPAs (in which a corporate doesn't directly take title to the electricity from the system, but the revenue stream from the sale of that electricity on the open market).
 - Other utility-enabled structures, like green tariffs and similar one-off arrangements have made these projects possible.
 - Still, these projects require large movements of capital and complicated legal and financial arrangements, making it difficult for all but the largest companies to execute a contract.
- [Community Solar](#) is an additional off-site option for a wider variety of companies, with specified rate structures reducing investment complexity in many markets.
 - While this report only tracks data on 14 corporate subscriptions to community solar projects, hundreds more exist.
 - **1.5 GW of community solar projects are operational in the U.S.**, with a mix of residential and corporate off-takers.
 - New community solar programs in several northeast states offer extensive opportunity going forward, with over 700 MW expected annually from 2021 – 2024.

Source: SEIA/Wood Mackenzie Power & Renewables, *U.S. Solar Market Insight*



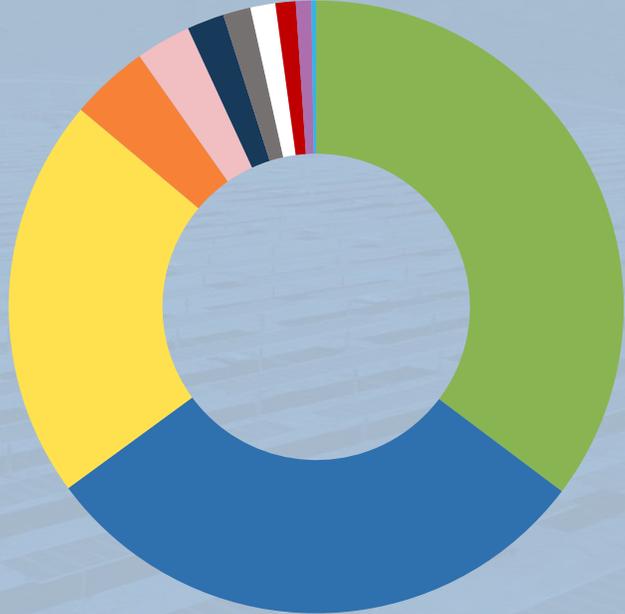
Solar Goes to Work for a Variety of Business Types

Installed Capacity by Facility Type



- Offsite
- Retail
- Manufacturing/R&D
- Commercial/Office
- Distribution/Warehouse
- Data Center
- Entertainment & Events
- Medical
- Storage
- Food & Beverage
- Agricultural

Number of Installations by Facility Type



- Retail
- Commercial/Office
- Manufacturing/R&D
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- Agricultural
- Medical
- Entertainment & Events
- Offsite
- Data Center
- Food & Beverage

While off-site projects make up 41% of installed commercial capacity, installations on retail structures continue to be the most prominent type of solar installation. Notably, 290 MW of solar capacity on manufacturing facilities has been installed over the past 5 years, behind only off-site and retail uses, reflecting consistent and growing solar activity in that space.

State Spotlights

- California continues to lead the nation for commercial solar due to a supportive policy environment and an excellent solar resource, resulting in a diverse mix of smaller on-site and larger off-site projects.
- New Jersey, New York and Massachusetts have consistently been near the front of the pack for commercial solar, with solid state-level policy and high building density resulting in many smaller rooftop systems.
- Large off-site projects have pulled North Carolina, Nevada and Virginia into the top 10. In all three of those states, the existence of large data centers has created opportunities for large-scale solar solutions.
- IKEA leads all businesses with installations in 27 states, followed by Brookfield Properties Retail Inc. with installations across 23 different states. Target rounds out the top 3 with solar installations in 22 states.

Top 10 States by Total Commercial Capacity

Rank	State	Capacity (MW)
1	CA	2,928.4
2	NJ	995.4
3	NY	619.6
4	MA	583.9
5	NC	356.0
6	NV	294.2
7	VA	265.5
8	AZ	147.7
9	SC	100.8
10	UT	88.0

Map: U.S. Corporate Solar Installations



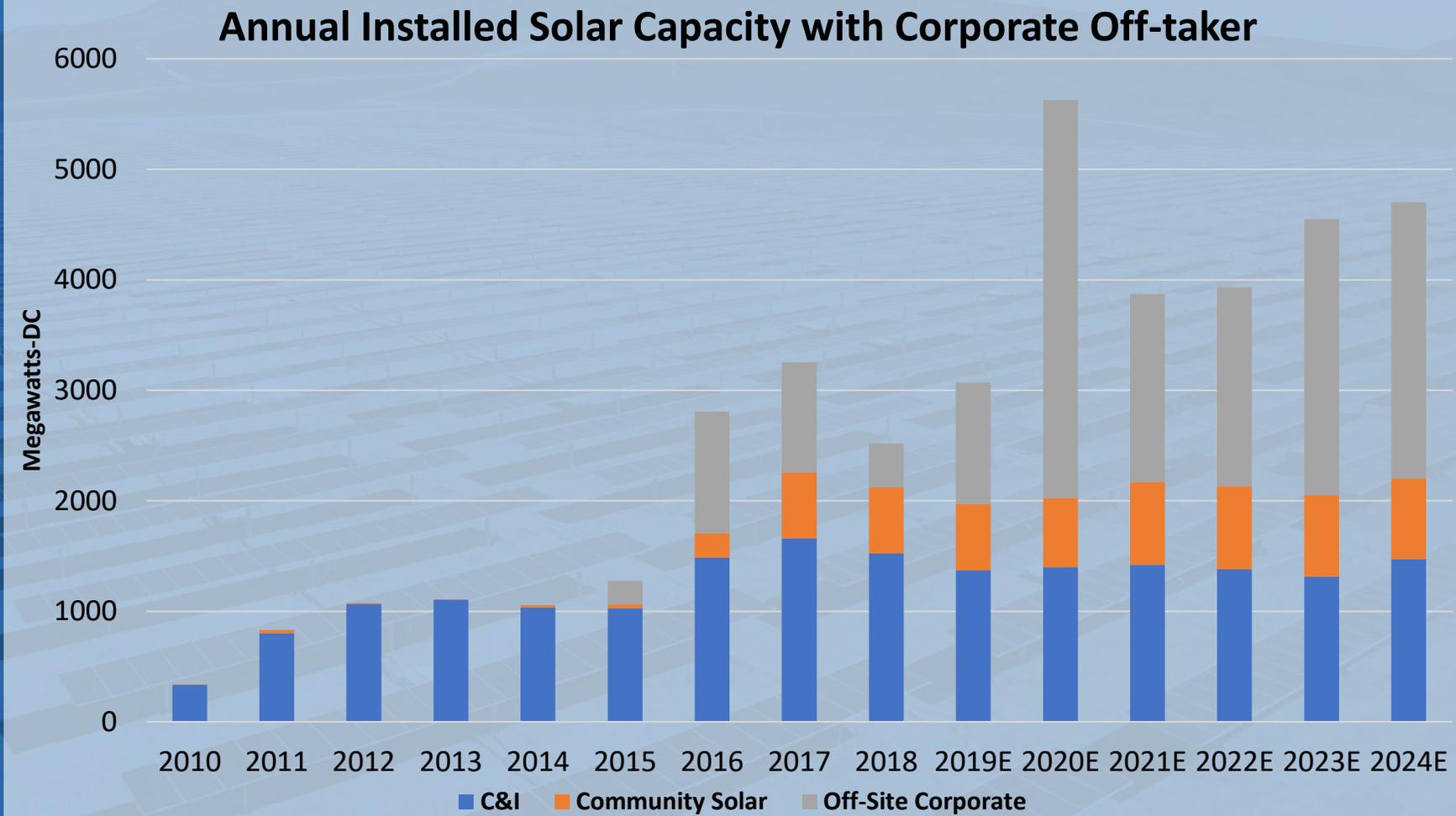
Explore every system in the Solar Means Business database using our interactive map at: solarmeanbusiness.com

Looking Forward

Corporate Solar on the Rise

Looking Ahead

- The Non-Residential solar market (including commercial, non-profit and community solar) is expected to decline 14% in 2019 as key state markets in California and Massachusetts continue to transition to new rate designs and incentive structures, and community solar deployment in Minnesota slows. Still, the market should see a top-three year for deployment.
- Growth is expected to resume in 2020 as module tariff reductions and ITC demand pull-in help to boost growth. Full ITC draw-down in 2022 causes market to flatten relative to what would be expected from an ITC extension. The growth of community solar programs in the outyears helps to mitigate ITC losses.
- Additionally, off-site corporate solar growth is expected to increase rapidly, with 3.3 GW procured in 2018 alone and an additional 500 MW announced in the first half of 2019. Starting in 2020, off-site corporate installations could represent more than 1 GW in deployment annually.



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight

Challenges and Opportunities for Commercial Solar

Challenges

- Solar module tariff will raise domestic prices and prevent full realization of market potential through 2021
- Declining state-level incentives in many markets
- Less attractive rate design
- Ramp-down of federal solar [Investment Tax Credit](#) scheduled to begin in 2020
- Move from early adopters to mainstream commercial consumers in established markets; customer acquisition issues

Opportunities

- Continued price decline opportunities, especially in permitting and inspection costs, which are among the highest in the world
- Increased electrification pushing wide variety of companies to think differently about electricity
- Decreasing costs of solar + storage create resiliency options, new revenue streams
- More large corporates committing to 100% renewable energy
- Increasing flexibility in pursuing large off-site projects as states, utilities and financial institutions lower barriers
- Many state markets remain untapped, creating growth potential as solar installer landscape becomes increasingly competitive

Solar + Storage for the Commercial Market

Storage at all levels on the grid



Generation	Transmission	Distribution	Behind the Meter
Energy Arbitrage	Congestion Relief	Congestion Relief	Manage Consumption
Variable Resource Integration	Transmission system upgrade deferral	Mitigate Outages	Back-up Power
Frequency Regulation	Improved Performance		Storage
Ramping			Resilience
Spinning/non-spinning reserves			
Voltage Support			
Black Start			
Management of Must Take Resources			

Compiled from Institute from Policy Integrity report on Managing the Future of Energy Storage

Why energy storage for commercial buildings?

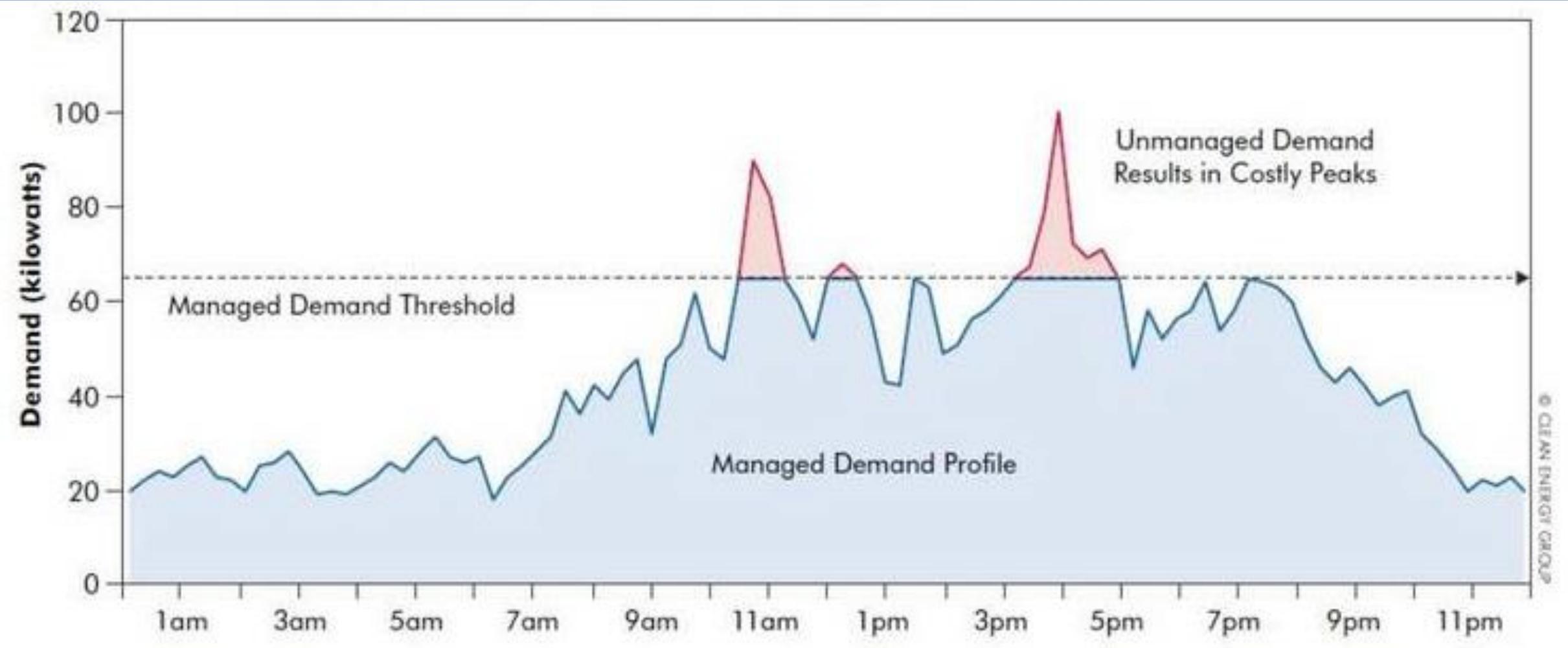
- Value to a building owner:
 - Enables load shifting → optimizes energy costs
 - Reducing peak power demand saves building owners money
 - Demand charges can account for over 50% of an electric bill
 - Charge onsite battery during times of low demand → discharge during peak demand instead of drawing from grid
- Value to grid operations
 - Flattens demand → increased reliability and decreased overall costs
 - Helps manage variability from renewable energy like wind and solar

Energy Storage and Demand Charges for Commercial Customers – a study by NREL

- “Over 25 percent of commercial customers across the country may be able to cost-effectively reduce their utility bills with battery storage technologies today” – NREL
 - Onsite battery storage is cost effective to commercial customers TODAY
 - Market opportunities for expanding onsite solar+storage across the country
- CA and NY show economic benefits for solar+storage, but Midwest and Southeast states are also promising
- States with low energy prices and high demand charges (GA, NE, CO, AZ) could benefit from storage

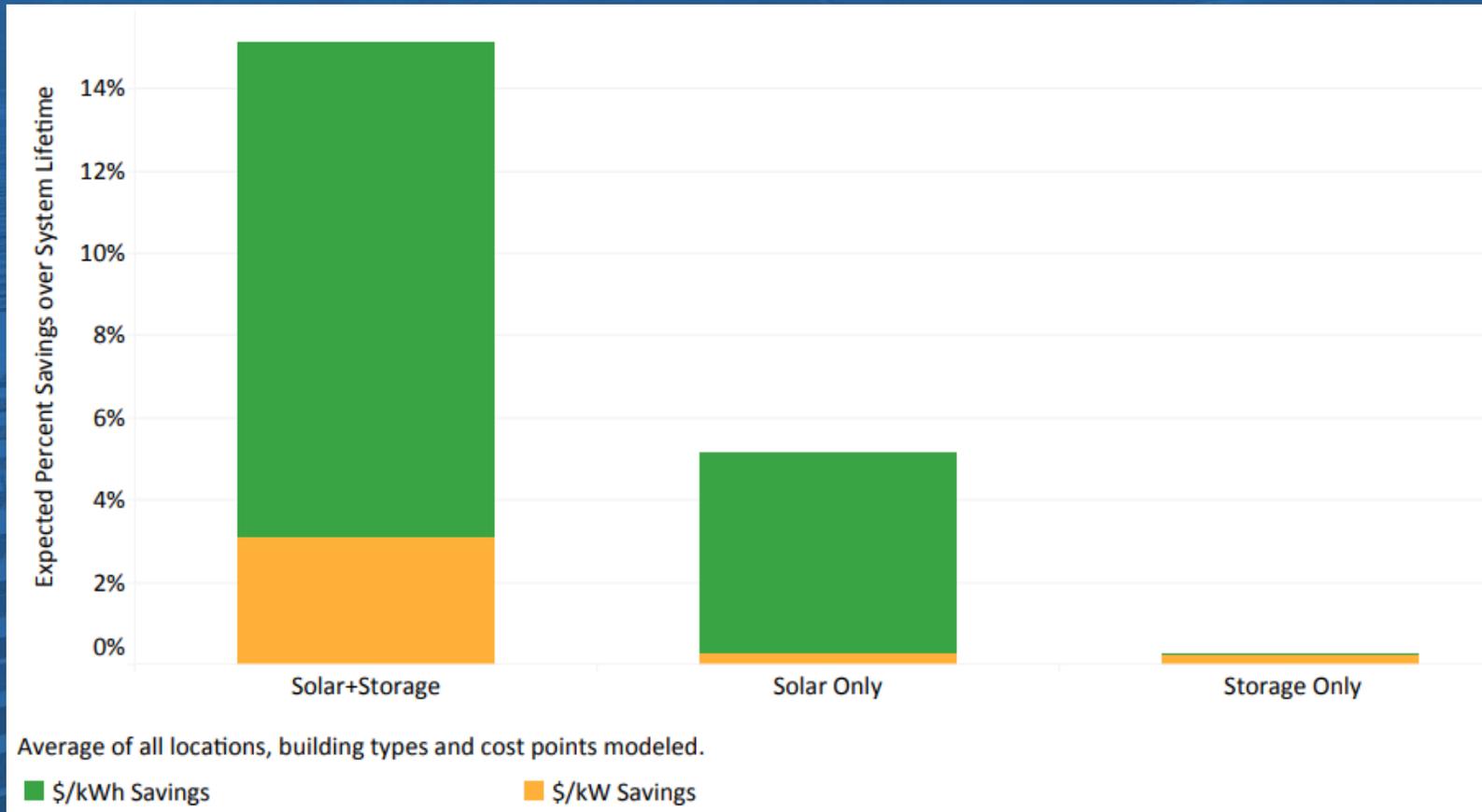
NREL and Clean Energy Group

How Battery Storage can Help Manage Electricity Demand



Source: NREL and Clean Energy Group

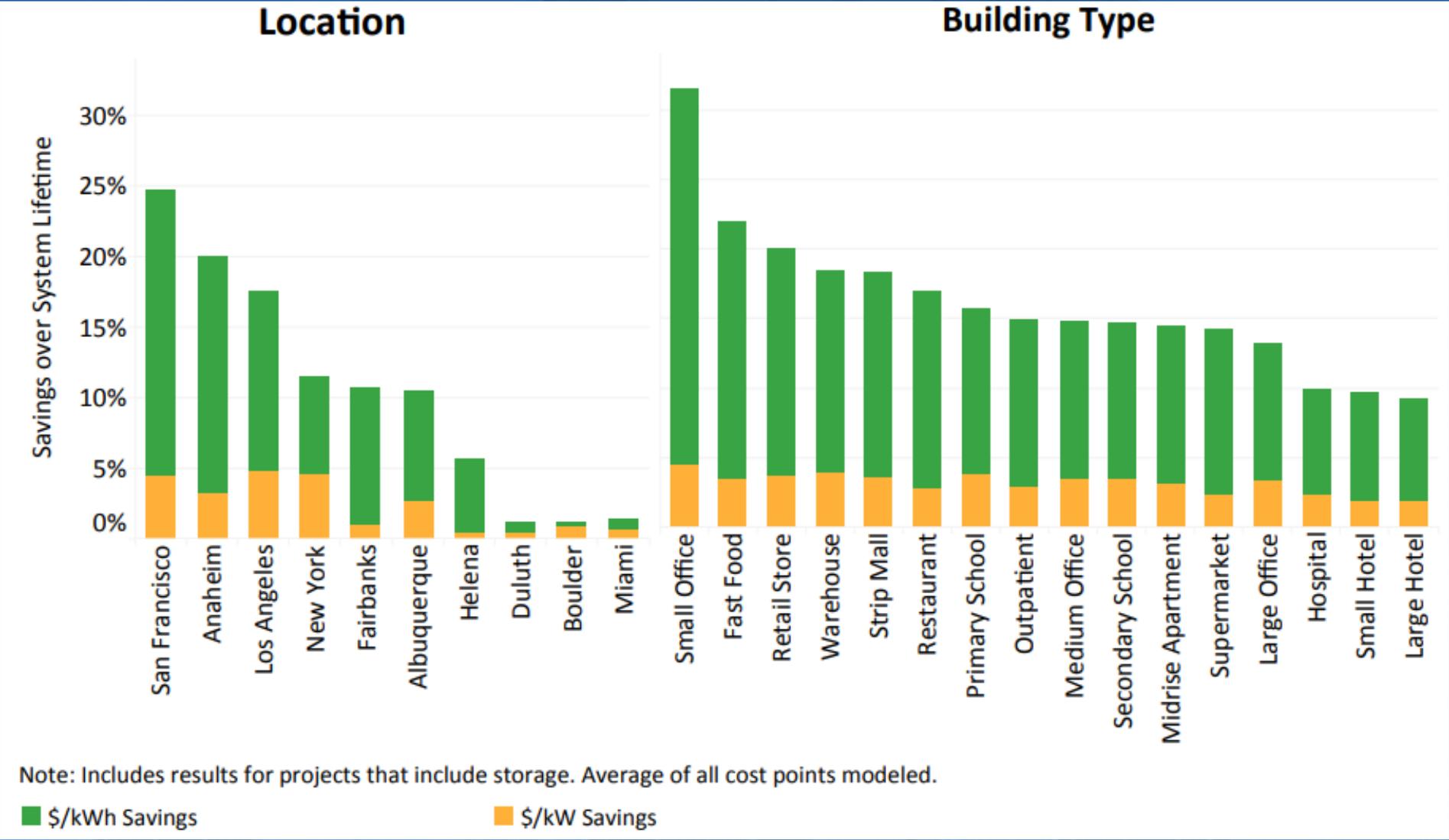
Savings from Demand and Energy Charge Reductions by Technology Combination



- Savings are highest for solar+storage projects.
- Storage-only projects are limited, only marginal demand charge savings.

Source: NREL

Demand and Energy Charge Reductions by Location and Building Type



Source: NREL

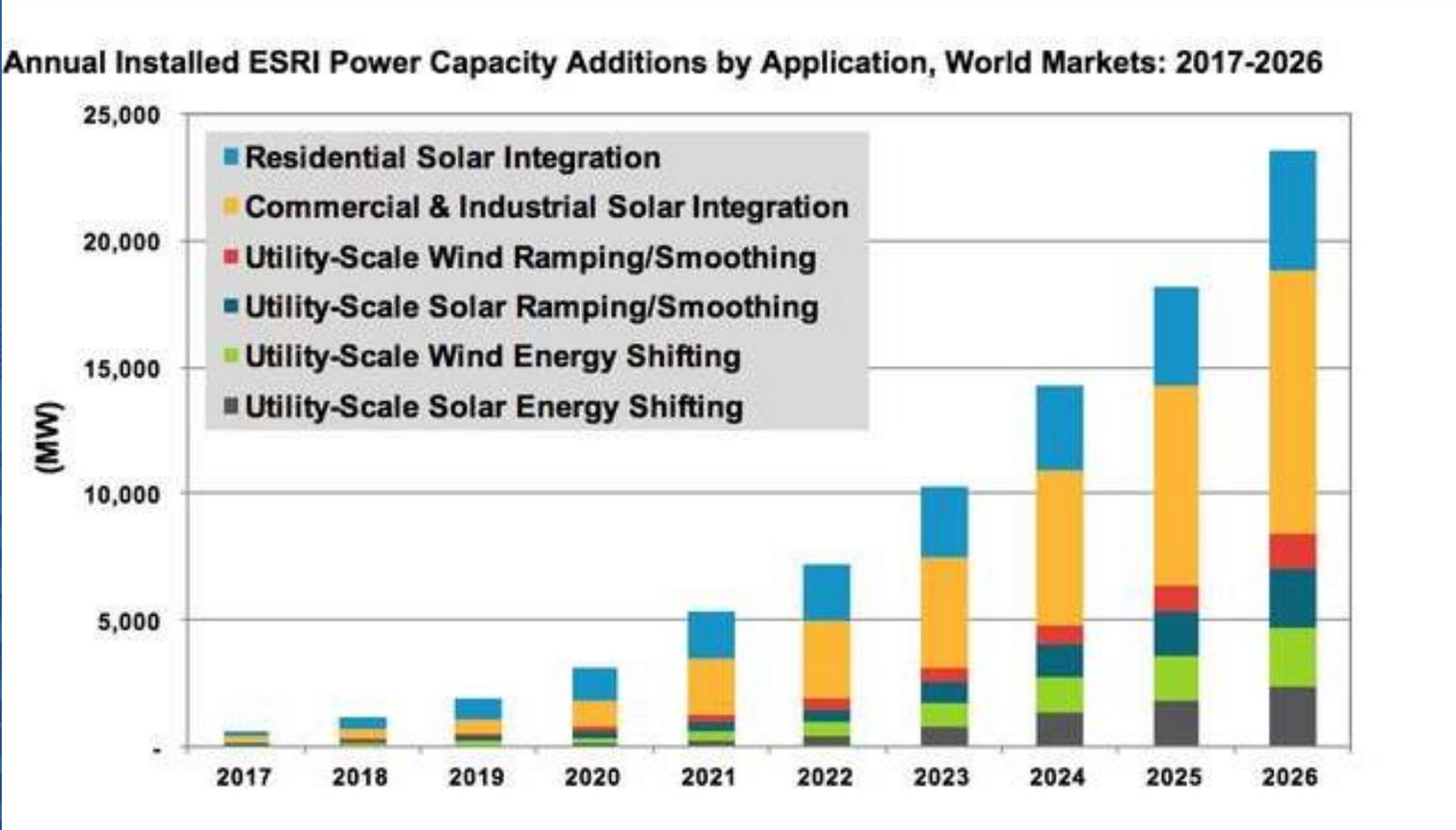
Valuing Resilience Provided by Solar and Battery Storage Systems

Valuing Resilience Increases the Economic Solar and Battery System Sizes on a Large Office

Value on Resiliency?	Assigned Value of Resiliency (\$/hour)	PV Size (kW)	Battery Capacity (kWh)	Net Present Value (\$)
No	\$0	961	0	\$111,000
Yes	\$14,365	1304	271	\$289,060

Source: NREL

Strong year for energy storage in commercial sector



Source: Navigant Research

<https://www.greenbiz.com/article/expect-strong-growth-year-commercial-energy-storage>

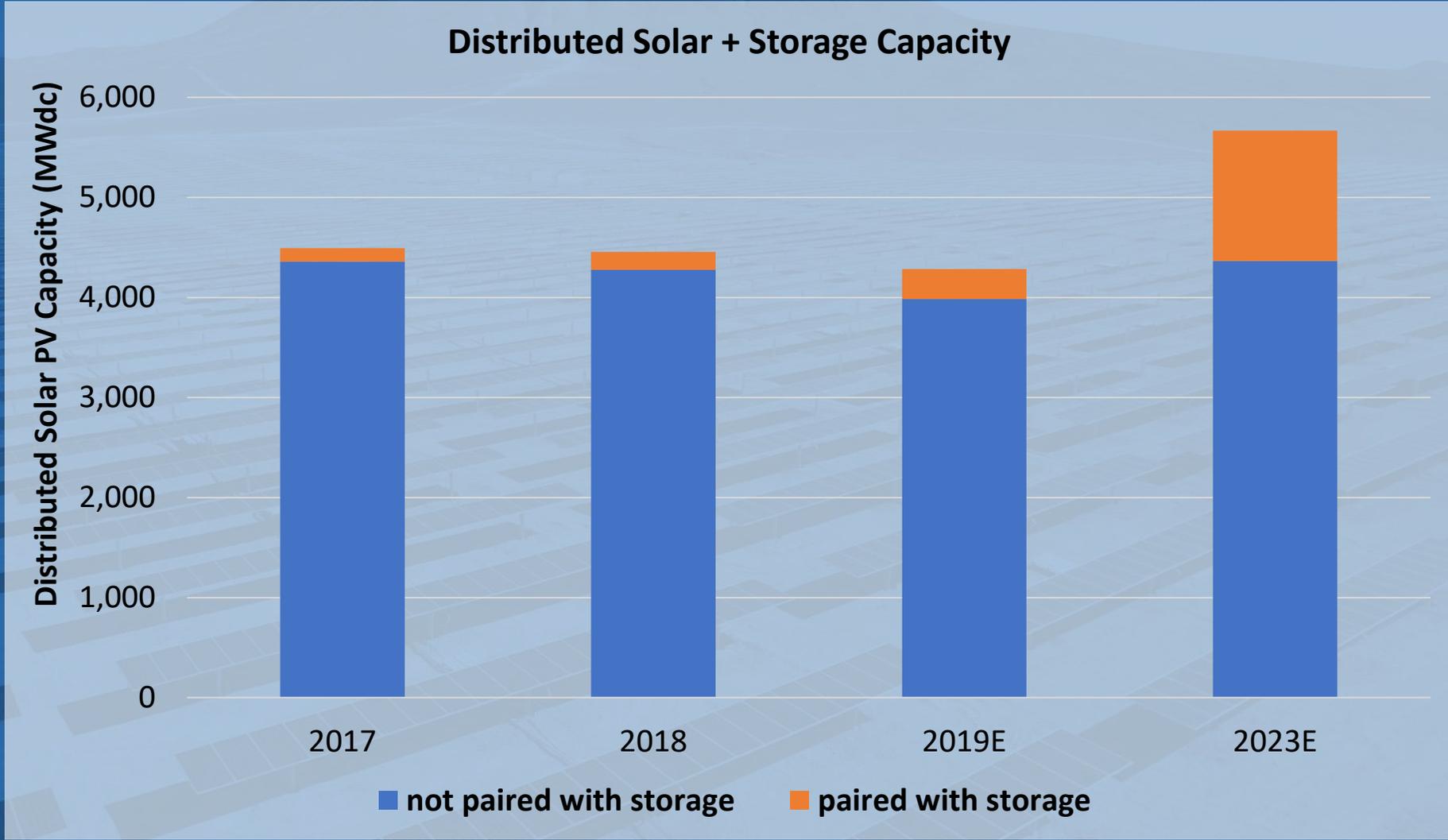
Drivers:

- Reduction of incentives for net energy metering and feed-in-tariffs
- Demand charges
- Sustainability initiatives
- Resilience requirements

75-90% of btm storage will be used for integration with on-site solar PV by 2026 (Navigant Research)

Growing Solar+Storage Adoption in DG markets

- By 2023, nearly a quarter of distributed solar will be paired with storage.
- Utility-Scale solar+storage was estimated at 5-10% of new capacity in 2018.
- Commercial and industrial markets can expect growth in adoption over the next few years.



Previewing Solar Goes Corporate

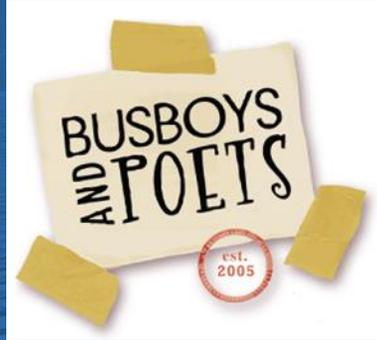
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DR. BRONNER'S
MAGIC



"ALL-ONE!"



Walgreens



Know Before You Go

When: Thursday, November 7th

Where: Eaton DC, 1201 K St NW, Washington, DC

Networking Reception: Solar Energy Industries Association HQ,
1425 K Street NW, Washington, DC 5:00pm – 7:00pm

SGCWEBINAR19 for **\$95 off** your Solar Goes Corporate registration!

Questions?

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