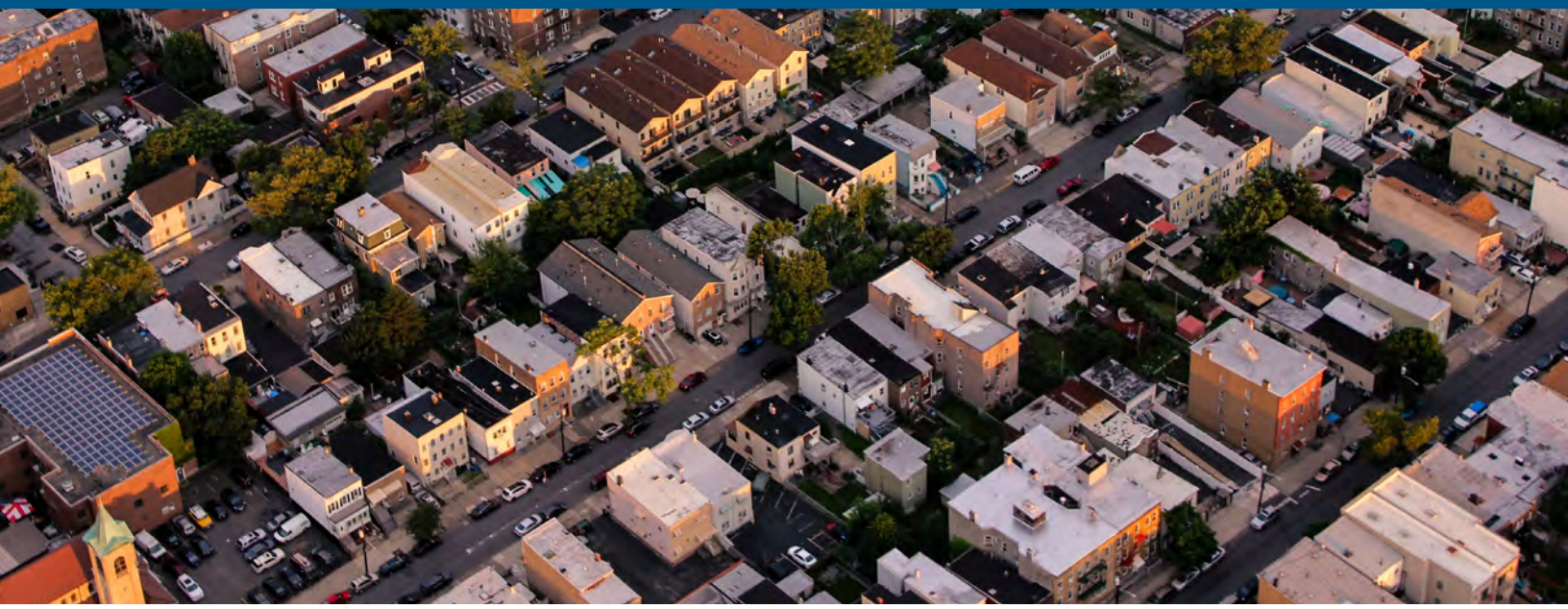
PACENation
Building the clean energy economy

2017

Economic, Energy, and Environmental Impact Report

C-PACE

Commercial Property Assessed Clean Energy



Address

PACENation
141 Tompkins Ave
Pleasantville, NY 10570

Contact

info@pacenation.org

Contents

Overview

PACENation's 2017 C-PACE Economic, Energy, and Environmental Impact Report is the first annual report on commercial property assessed clean energy (PACE) market data and trends. To develop this report, PACENation surveyed commercial PACE administrators, capital providers, and other service providers to track PACE project closings on commercial properties. The numbers presented in this report summarize aspects of the cumulative C-PACE market from 2009 to year-end 2017, unless otherwise noted.

This report makes use of data from the following organizations:[1]

- City of Ann Arbor, MI
- City of Milwaukee, WI
- City of Toledo, OH
- CleanFund Commercial PACE Capital
- Columbus-Franklin Port Authority
- Connecticut Green Bank
- County of Boulder, CO
- County of Los Angeles, CA
- County of Sonoma, CA
- Energize NY
- Energy Equity Funding
- Figtree Financing
- Florida Green Energy Works
- Greater Cincinnati Energy Alliance
- Green Finance San Francisco
- Greenworks Lending
- Levin Energy Partners
- MinnPACE, St. Paul Port Authority
- Missouri Clean Energy District
- mPOWER
- PACE Equity
- PACE Loan Group
- PETROS PACE Finance
- Renew Financial
- Samas Capital
- Show Me PACE
- Solar Energy Loan Fund
- Southwest Regional Development Commission
- Sustainable Real Estate Solutions
- Texas PACE Authority
- Urban Ingenuity
- Utah Clean Energy
- WECC, Energy Finance Solutions
- Ygrene

[1] Includes data from 2017 and/or previous years.

KEY FINDINGS

C-PACE MARKETS EXPANDED AND EVOLVED IN 2017

PACENation's review of 2017 C-PACE activity found that the sector grew faster than in any previous year, completing $251M in funding in a single year, which marked an increase of 75% in cumulative funding compared to 2016. These investments brought the market's cumulative total to $588M.

This growth was driven by expansion in both existing and new market categories, including C-PACE for new construction properties, which accounted for 18% of 2017 funding. Property owners in Colorado, Kentucky, Minnesota, and Washington, D.C. used C-PACE to make $36.6M in energy-saving infrastructure investments to 5 major new construction properties, compared to total new construction financing of $9.7M the prior year.

In 2017, C-PACE lenders broke records for the largest project: a $40M seismic retrofit to Seton Medical Center in Daly City, CA. Overall, six projects over $5M, and four projects over $10M, closed in the year. In addition, the first ever rated C-PACE securitization was completed by Greenworks Lending, marking a milestone for PACE as a distinct asset class.

C-PACE SHOWED STRONG GROWTH IN EVERY REGION OF THE U.S.

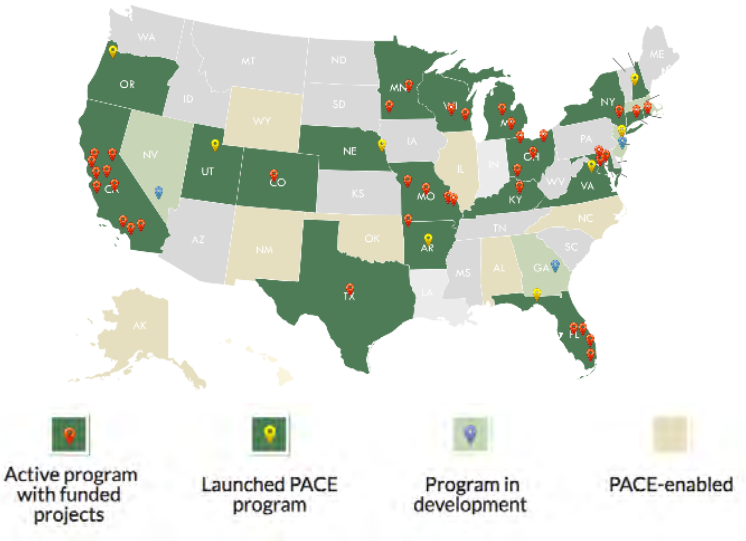
Building owners across the country are using C-PACE to make their properties more energy-efficient, more cost-effective, and more comfortable. In 2017, C-PACE helped property owners throughout the Northeast, Midwest, South, and Western U.S. improve the efficiency of their buildings, with the greatest cumulative funding growth (229%) in the South attributable to a ramp-up of investments in Texas and Florida. See the regional overviews on page 10 for more information.

C-PACE DROVE JOB CREATION AND IMPACTED LOCAL ECONOMIES

Investments made with C-PACE drive local job creation: at year-end 2017, C-PACE investments had created an estimated 5,600 to 8,800 jobs, and sparked $800 to $1,500 in economic impact to local economies. C-PACE-funded projects also impacted the environment: these improvements are estimated to save 6.3M mWh of energy over their useful lifetimes, which will lead to the reduction of 3M metric tons of greenhouse gas emissions – equal to the emissions from 345M gallons of gasoline.

LEGISLATURES ACROSS THE U.S. CONTINUED TO SUPPORT C-PACE LEGISLATION

C-PACE legislation is active in 33 states, and 21 states have launched programs (incl. D.C.). In 2017, C-PACE enabling legislation passed in three states – Alaska, Illinois, and Nevada – and three programs launched in Nebraska, Utah, and Virginia.



PROGRESS SUMMARY

TOTAL MARKET, CUMULATIVE (2009-2017)

1,450

buildings improved with C-PACE

508 added in 2017

59% increase from 2016

$588 million

total invested

$251M added in 2017

75% increase from 2016

33

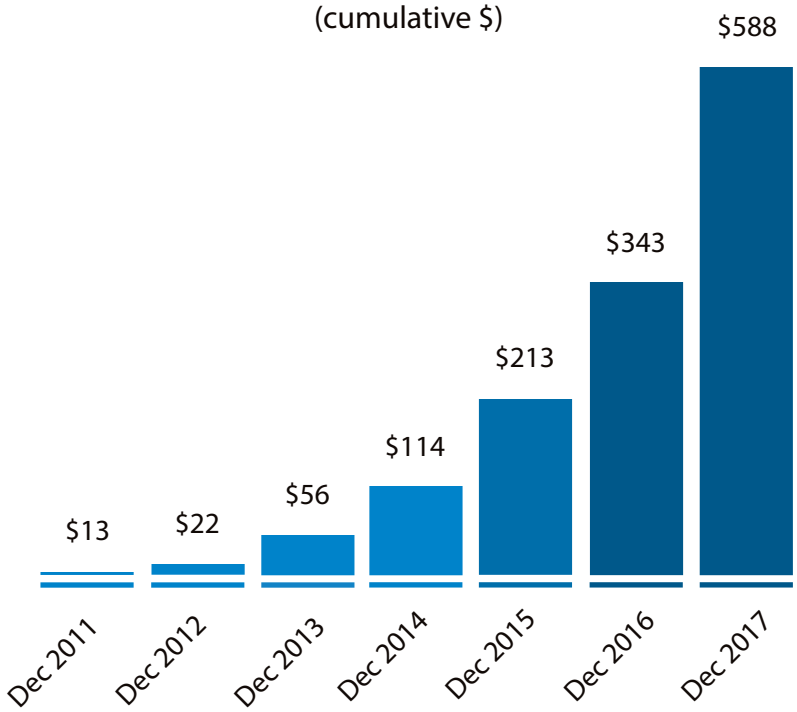
states C-PACE enabled[2]

3 states added in 2017

Alaska, Illinois, Nevada

C-PACE investment

(cumulative $)



New C-PACE programs

(launched in 2017)

Omaha PACE

Nebraska

Utah C-PACE

Utah

Arlington C-PACE

Virginia

Visit PACENation.us/pace-programs for more information.

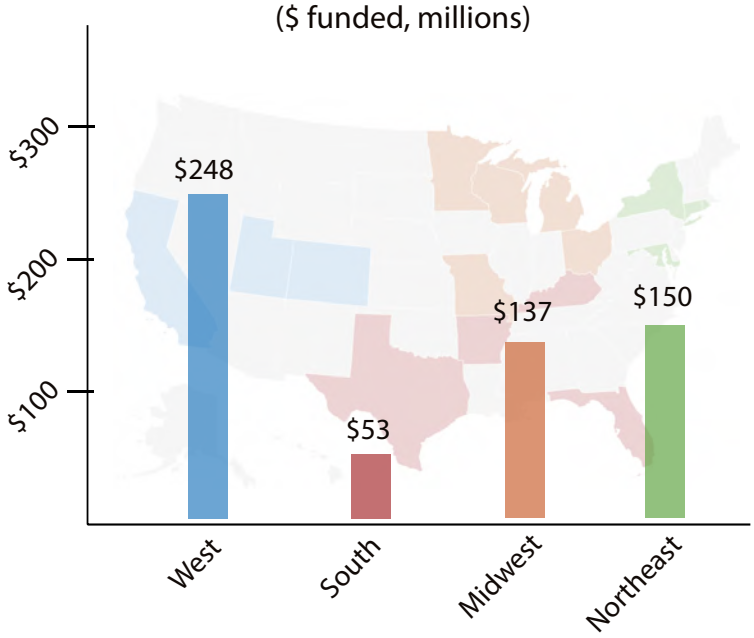
[2] Number includes D.C., and does not include residential-only states ME and NH

PROGRESS SUMMARY

TOTAL MARKET, CUMULATIVE (2009-2017)

C-PACE by U.S. region

($ funded, millions)



See regional summaries (pg. 10) for more information.

Improvement types

(by $ funded)

47%
energy efficiency

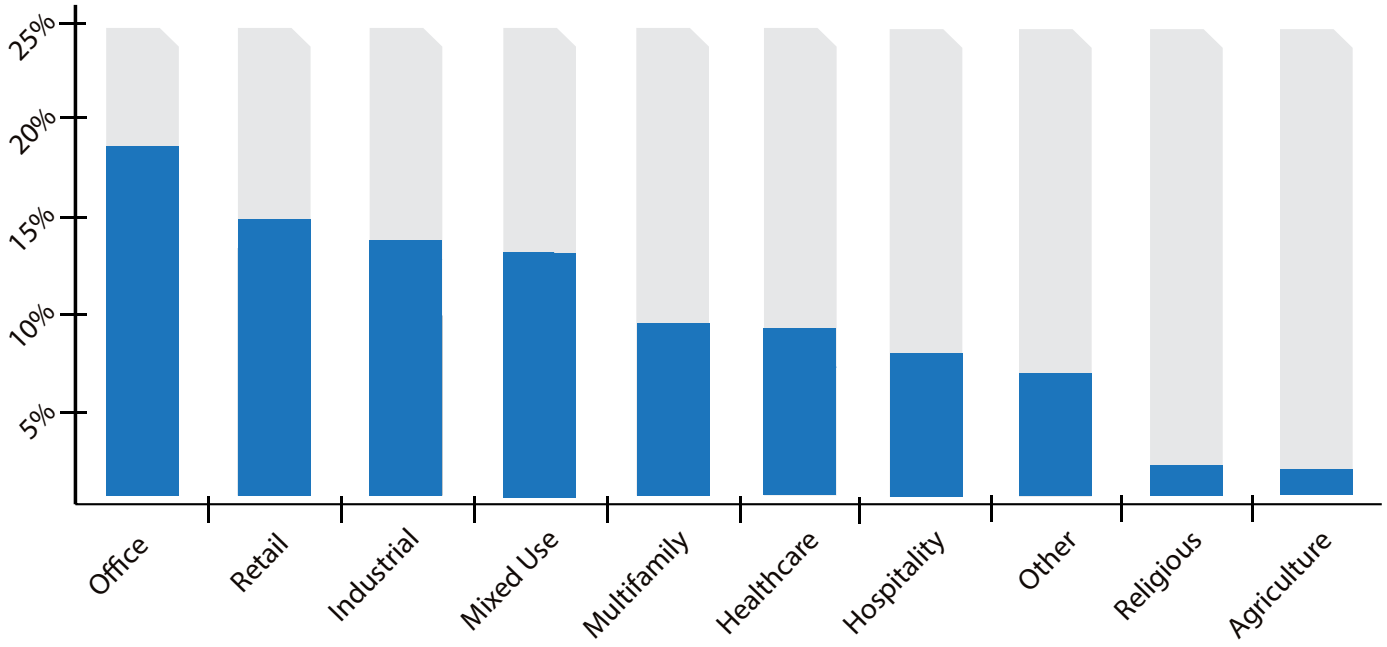
26%
renewable energy

19%
mixed

8%
resiliency

Building categories

(by $ funded, showing categories over $5m)

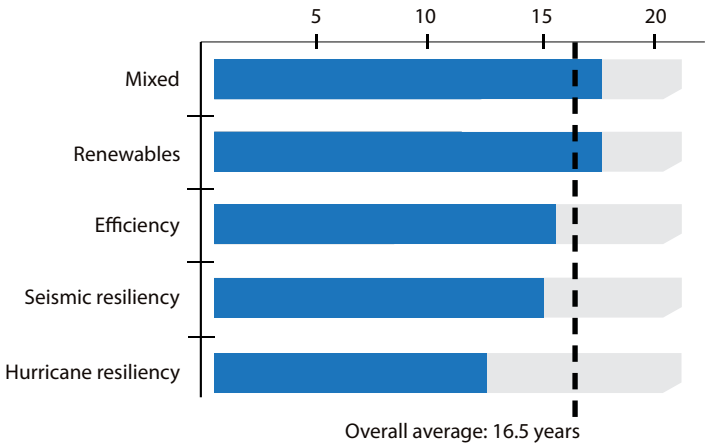


PROGRESS SUMMARY

TOTAL MARKET, CUMULATIVE (2009-2017)

Project term lengths

(years)



C-PACE buildings

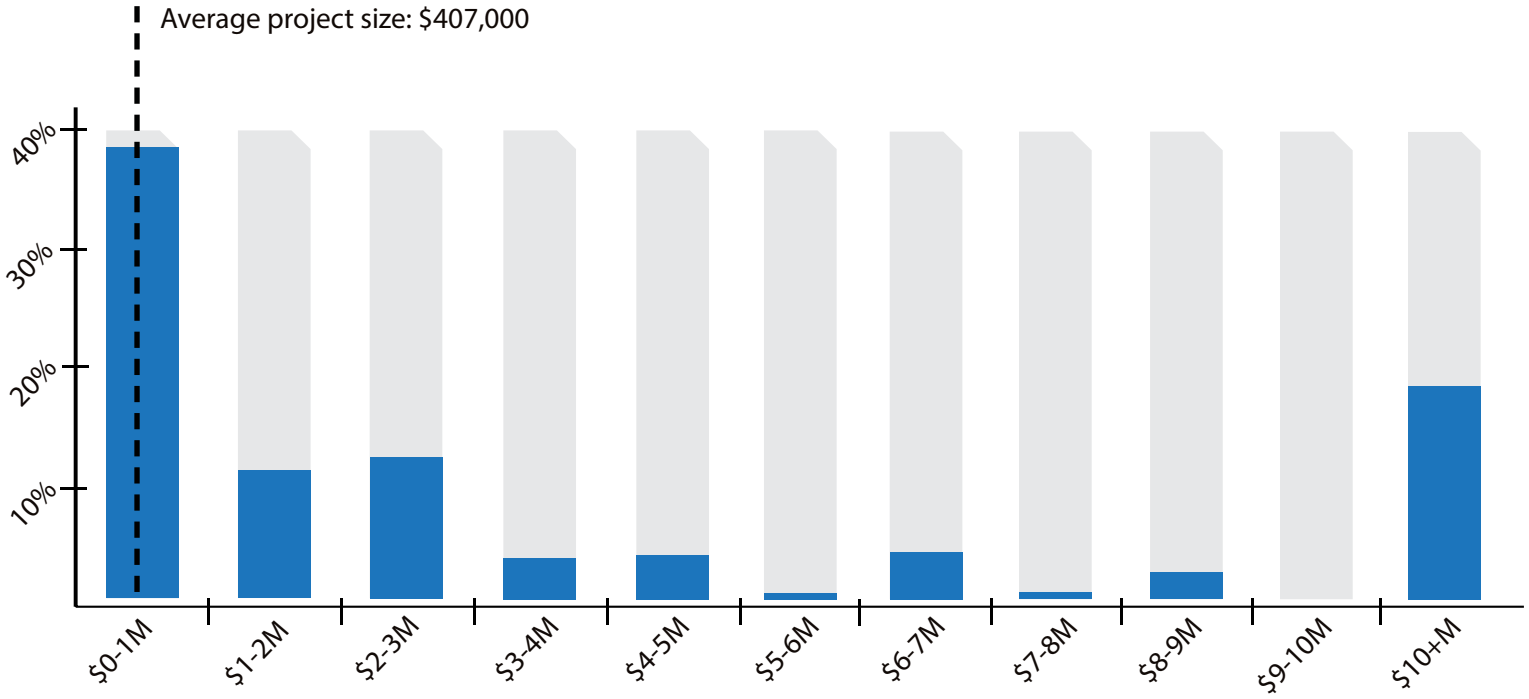
(by $ funded)

10%
Nonproft-owned or operated
(24% of 2017 funding)

8%
New construction
(18% of 2017 funding)

Project sizes

(by $ funded)



TOTAL MARKET, CUMULATIVE (2009-2017)

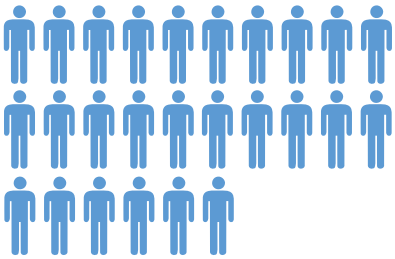
Economic Impacts

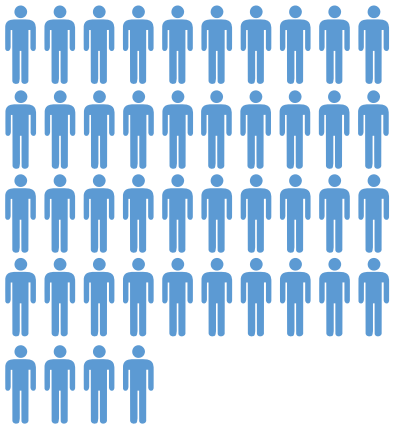
1. Jobs created as a result of C-PACE investments

Estimated range 5,600 — 8,800 jobs

2. Economic activity generated as a result of C-PACE investments

Estimated range $800 — $1,500 million





2016

1,300 jobs added in 2016

61% increase from 2015

2017

2,200 jobs added in 2017

65% increase from 2016

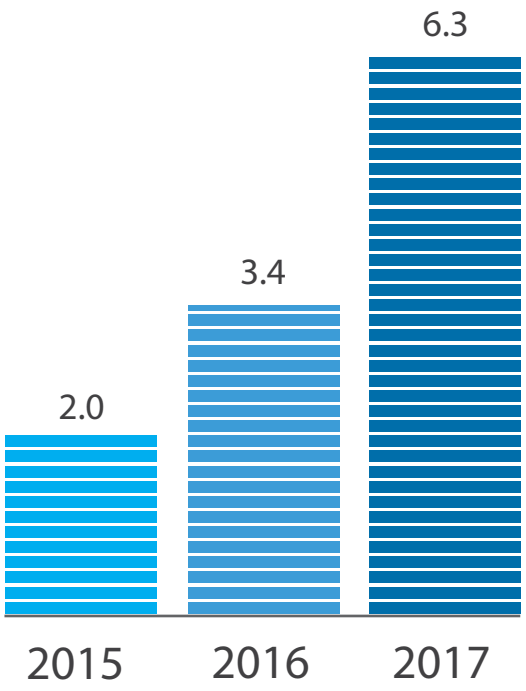
= 50

TOTAL MARKET, CUMULATIVE (2009-2017)

Environmental Impacts

Energy savings

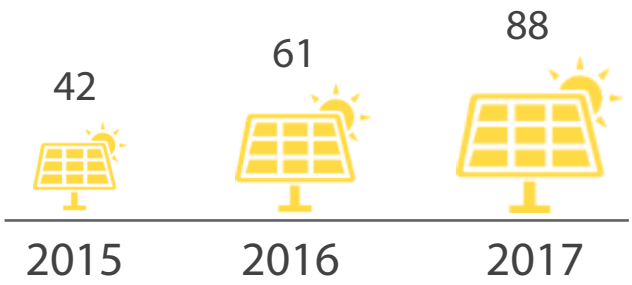
(cumulative estimated mWh, millions)



Estimated over useful lifetime of installed measures

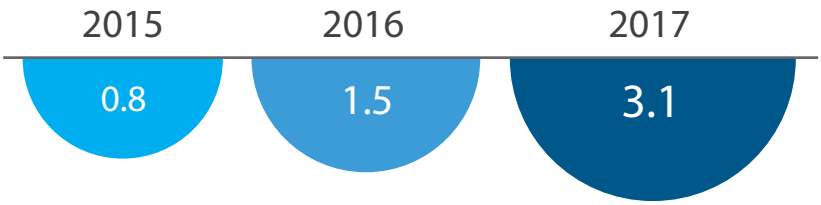
Solar capacity installed

(cumulative estimated MW)



Greenhouse gas emissions avoided

(cumulative estimated CO2e, million metric tons)



Estimated over useful lifetime of installed measures

Avoided GHG emissions equal to:

331,000 homes' energy usage for one year

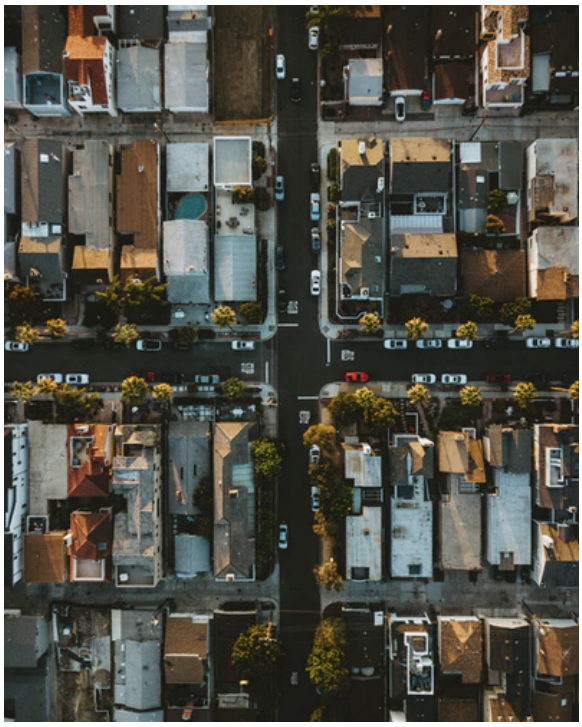
657,000 cars taken off the road for one year

345M gallons of gasoline

25,000 acres of forest preserved for one year

Regional Summaries

PACENation tracked C-PACE markets within 17 states in which C-PACE programs have closed projects, and produced estimates of job creation, economic impacts, and environmental impacts, in the following regions:



Corona Del Mar, Newport Beach (PACE enabled)

2017 Quick facts

- **Most financed**: West ($105 million)
- **Most growth**: South (229%)
- **Largest projects**:
  - **California:** Seton Medical Center ($40M)
  - **Washington D.C.:** D.C. United Stadium ($25M)
  - **Texas:** Butler Brothers ($23.9M)
  - **Missouri:** Missouri Theater Building ($10.1M)
  - **California:** Verseon Corporation ($8.6M)
  - **Minnesota:** Go Wild ($6.7M)

Top C-PACE states
(ranked by dollars invested)

State	Buildings improved with PACE	Total C-PACE investment ($, millions)	% of total C-PACE investment
California	790	236.3	40.1%
Connecticut	181	103	17.5%
Minnesota	130	41.8	7.1%
Missouri	22	38.9	6.6%
D.C.	15	34.3	5.8%
Texas	12	33.6	5.7%
Ohio	114	33.3	5.7%
Wisconsin	9	16.0	2.7%
Florida	79	13.3	2.3%
Colorado	39	11.9	2.0%
Maryland	13	7.8	1.3%
Michigan	14	7.4	1.3%
Kentucky	2	5.2	0.9%
New York	18	2.6	0.5%
Rhode Island	4	2.2	0.4%
Arkansas	2	0.7	0.1%
Utah	1	0.1	0.02%

Northeast

REGIONAL SUMMARY

NORTHEAST

The northeast region of the U.S. has active PACE programs in four states — CT, MD, NY, RI — and Washington, D.C. At year-end 2017, C-PACE programs in the region had completed 231 projects, which amounted to $150M of cumulative funding. In 2017 alone, $52M was funded, which marked a 53% increase in cumulative funding compared to the previous year.

The most common beneficiaries of C-PACE funding were Office buildings ($40M), and C-PACE was most commonly used for renewable energy improvements (41% of total funding).

STATES WITH CLOSED C-PACE PROJECTS:
CT, MD, NY, RI, and D.C

PROJECT HIGHLIGHT: D.C. UNITED STADIUM

DC-PACE was able to solve a challenge for DC United's Audi Field. Plans for the new construction project, a 20,000 seat stadium, were in need of further investment. DC-PACE was able to uncover savings through the installation of water conservation measures, energy efficiency and renewables. PACE enabled the stadium to access additional funds, which was instrumental in closing the capital gap. This landmark project boasts the largest PACE financing by a single lender, the largest new construction project using PACE, and the first use of PACE for a stadium arena.

PROJECT OVERVIEW

PROPERTY TYPE:
Recreation / Stadium

TOTAL FINANCING:
$25 million

TERM LENGTH:
20 years

LENDER:
Eagle Bank

PROGRAM ADMINISTRATOR:
URBAN INGENUITY

Source: Urban Ingenuity

PROGRESS SUMMARY

NORTHEAST, CUMULATIVE (2013-2017)

231

buildings improved with C-PACE

- 71 added in 2017
- 45% increase from 2016

$150 million

total invested

- $52M added in 2017
- 53% increase from 2016

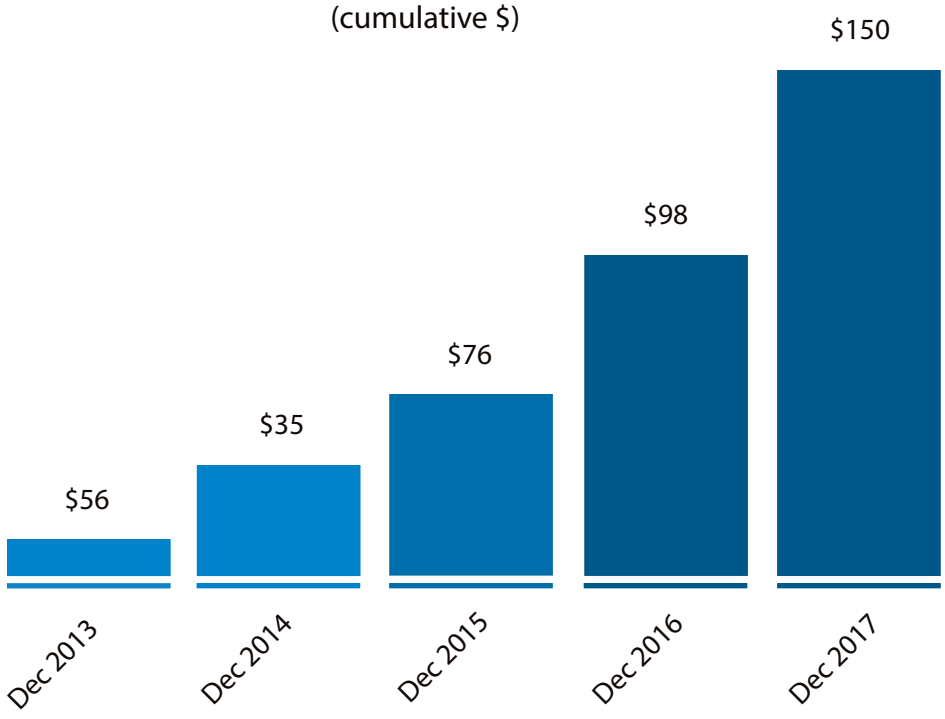
7

C-PACE programs

- 8 states C-PACE enabled
- 5 states with funded projects

C-PACE investment

(cumulative $)



PROGRESS SUMMARY

NORTHEAST, CUMULATIVE (2013-2017)

Improvement types

(by $ funded)

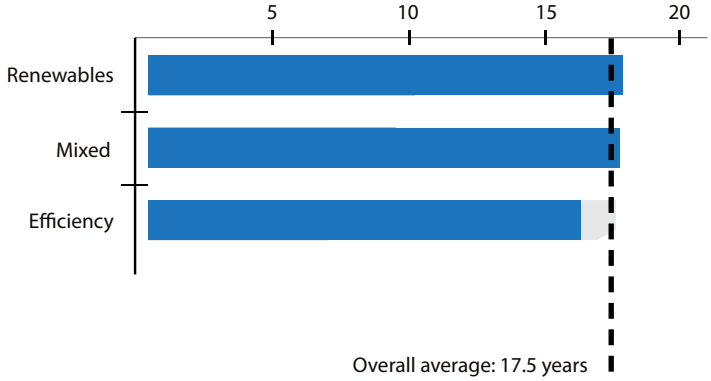
41%
renewable energy

30%
efficiency

29%
mixed

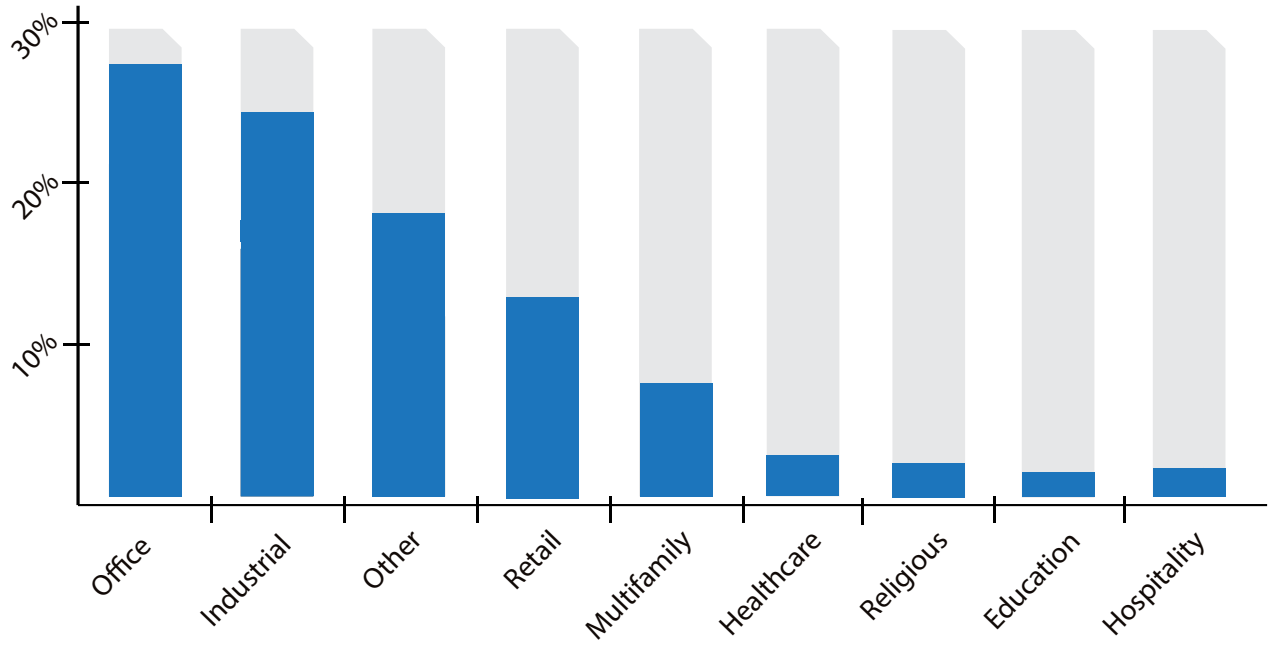
Project term lengths

(years)



Building categories

(by $ funded)



NORTHEAST, CUMULATIVE (2013-2017)

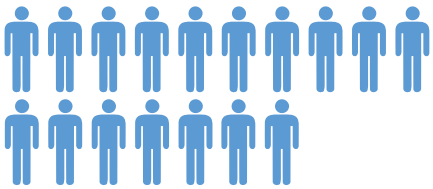
Economic Impacts

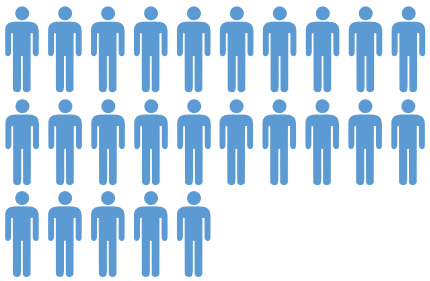
1. Jobs created as a result of C-PACE investments

Estimated range 1,100 — 2,300 jobs

2. Economic activity generated as a result of C-PACE investments

Estimated range $190 — $375 million





2016

170 jobs added in 2016

25% increase from 2015

2017

250 jobs added in 2017

30% increase from 2016

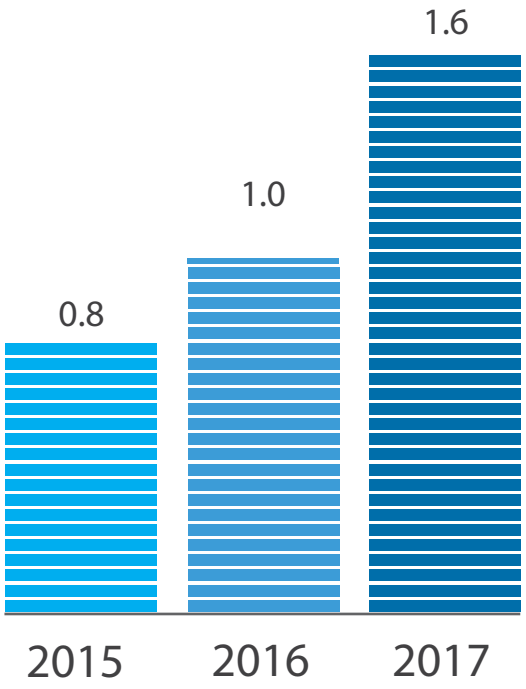
= 10

TOTAL MARKET, CUMULATIVE (2009-2017)

Environmental Impacts

Energy savings

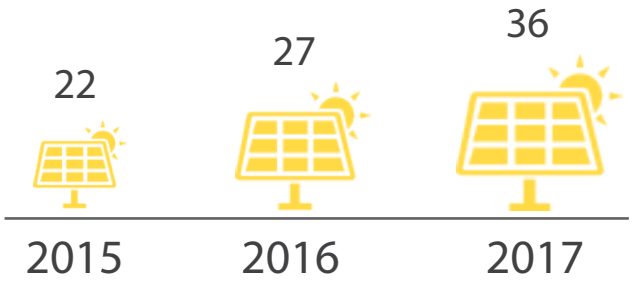
(cumulative estimated mWh, millions)



Estimated over useful lifetime of installed measures

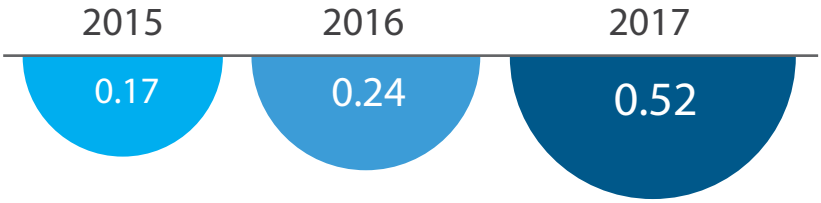
Solar capacity installed

(cumulative estimated MW)



Greenhouse gas emissions avoided

(cumulative estimated CO2e, million metric tons)



Estimated over useful lifetime of installed measures

Avoided GHG emissions equal to:

- 58,000 homes' energy usage for one year
- 115,000 cars taken off the road for one year
- 60M gallons of gasoline
- 4,000 acres of forest preserved for one year

Midwest

REGIONAL SUMMARY

MIDWEST

The midwestern region of the U.S. has active PACE programs in five states — MI, MN, MO, OH, and WI. From 2011-2017, C-PACE programs in the region completed 213 projects, which amounted to $137M of cumulative funding. In 2017 alone, $58M was funded, which marked a 72% increase in cumulative funding compared to the previous year.

The most common beneficiaries of C-PACE funding were Office buildings ($27.5M), and C-PACE was most commonly used for energy efficiency improvements (85% of total funding).

STATES WITH CLOSED C-PACE PROJECTS:
MI, MN, MO, OH, WI

PROJECT HIGHLIGHT: MISSOURI THEATER BUILDING

The Missouri Theater Building is an historic property in the Grand Center Arts District of St. Louis, but was left vacant due to the need for significant retrofitting. In recent years, plans were designed to bring this iconic building back to life as part of a mixed-use redevelopment, and PACE was a critical aspect of the financing puzzle. The overall project encompassed comprehensive energy efficiency measures on the Angad Arts Hotel, a full-service restaurant, two banquet and meeting facilities, and a large scale parking lot that now inhabit the 12-story building.

PROJECT OVERVIEW

PROPERTY TYPE:
Mixed use

TOTAL FINANCING:
$10 million

TERM LENGTH:
20 years

MEASURES:
Insulation; windows; LED lighting; high efficiency heating and cooling; building envelope.

PROGRAM ADMINISTRATOR:
Set the PACE St. Louis

Source: Set the PACE St. Louis

PROGRESS SUMMARY

MIDWEST, CUMULATIVE (2011-2017)

213

buildings improved with C-PACE

- 88 added in 2017
- 70% increase from 2016

$137 million

total invested

- $58M added in 2017
- 72% increase from 2016

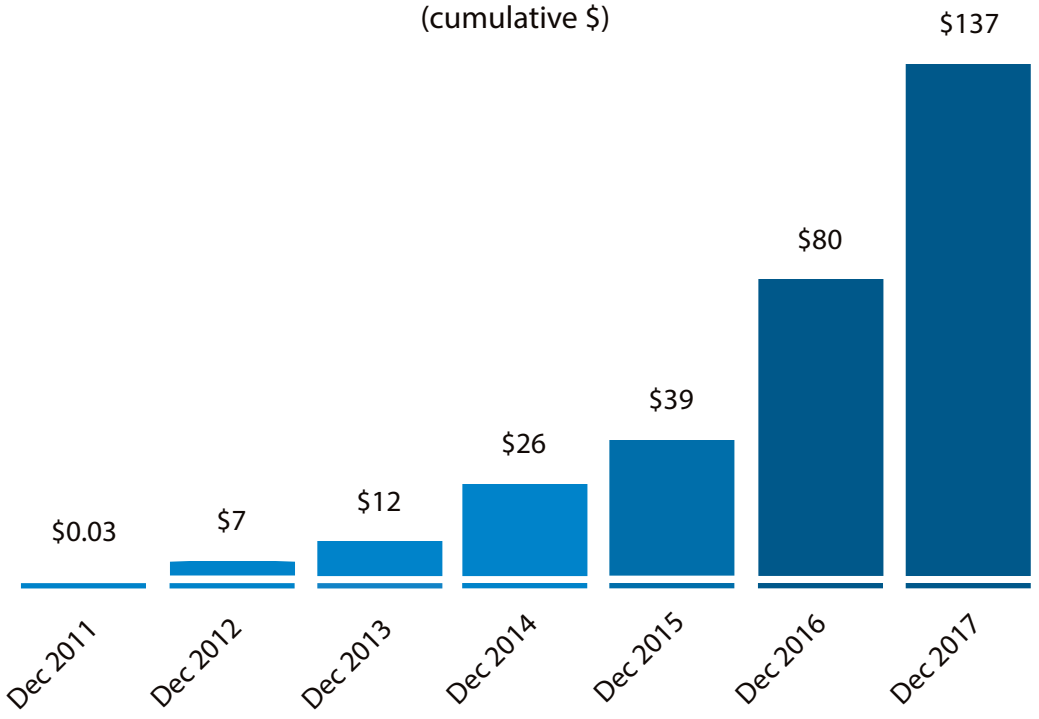
14

C-PACE programs

- 8 states C-PACE enabled
- 5 states with funded projects

C-PACE investment

(cumulative $)



PROGRESS SUMMARY

MIDWEST, CUMULATIVE (2011-2017)

Improvement types

(by $ funded)

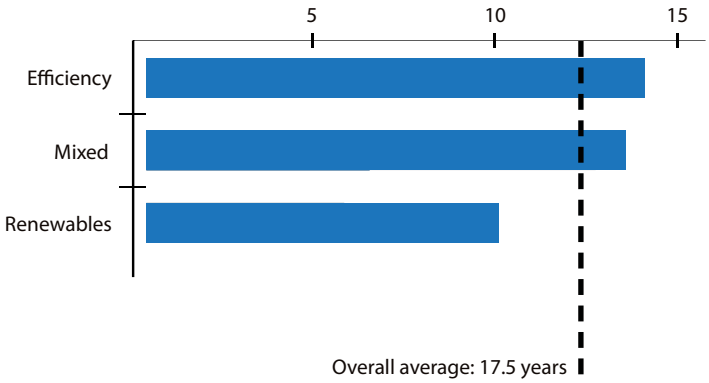
85%
energy efficiency

9%
renewable energy

5%
mixed

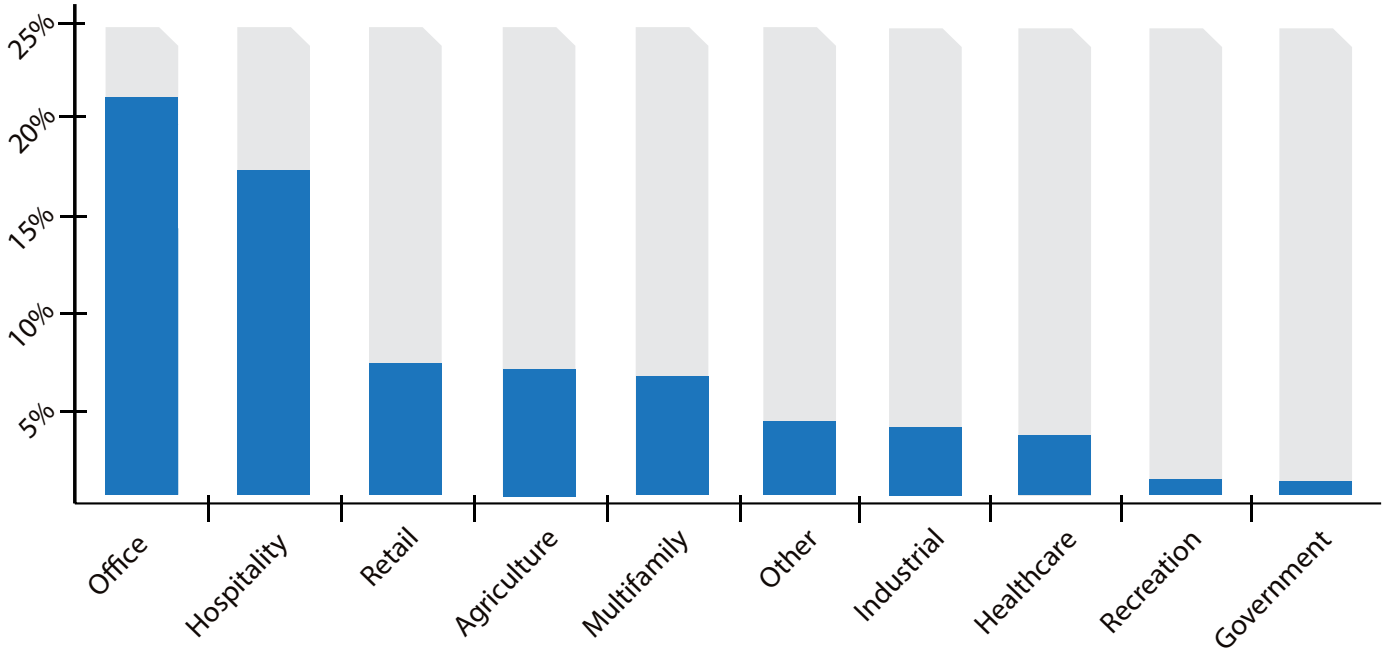
Project term lengths

(years)



Building categories

(by $ funded)



MIDWEST, CUMULATIVE (2011-2017)

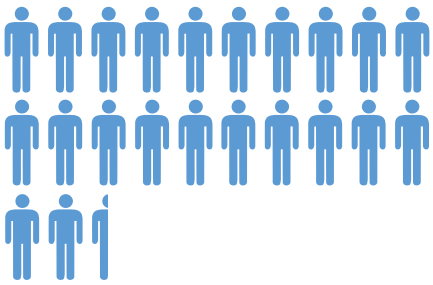
Economic Impacts

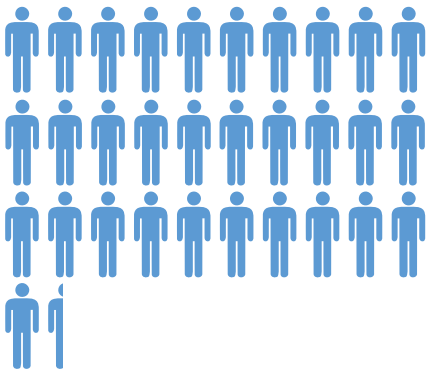
1. Jobs created as a result of C-PACE investments

Estimated range 1,500 — 2,000 jobs

2. Economic activity generated as a result of C-PACE investments

Estimated range $200 — $340 million





2016

450 jobs added in 2016

105% increase from 2015

2017

630 jobs added in 2017

70% increase from 2016

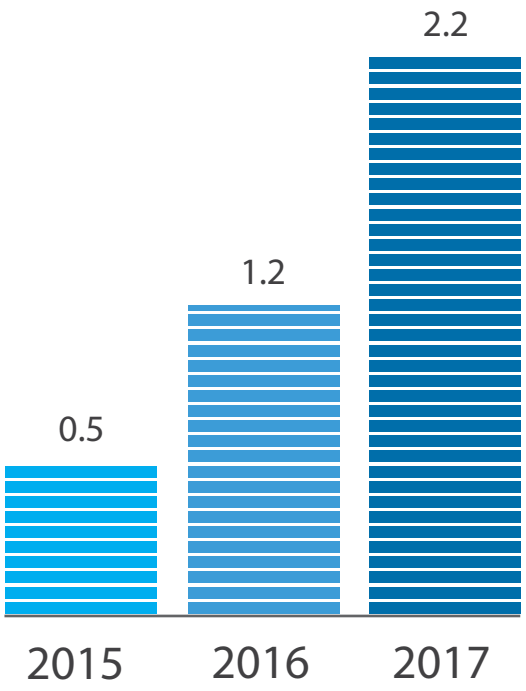
= 20

MIDWEST, CUMULATIVE (2009-2017)

Environmental Impacts

Energy savings

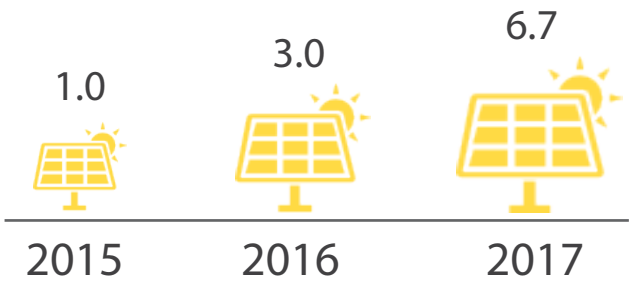
(cumulative estimated mWh, millions)



Estimated over useful lifetime of installed measures

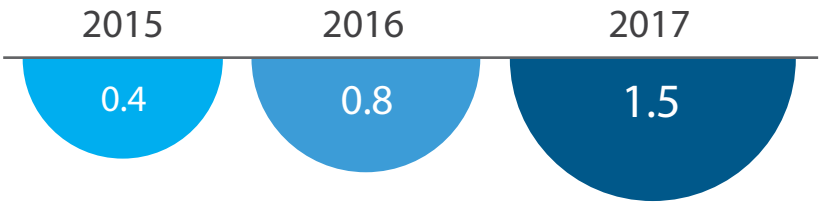
Solar capacity installed

(cumulative estimated MW)



Greenhouse gas emissions avoided

(cumulative estimated CO2e, million metric tons)



Estimated over useful lifetime of installed measures

Avoided GHG emissions equal to:

- 129,000 homes' energy usage for one year
- 255,000 cars taken off the road for one year
- 134M gallons of gasoline
- 9,700 acres of forest preserved for one year

South

REGIONAL SUMMARY

SOUTH

The southern region of the U.S. has active PACE programs in four states — AR, FL, KY, and TX. From 2013-2017, C-PACE programs in the region completed 95 projects, which amounted to $52.7M of cumulative funding. In 2017 alone, $36.7M was funded, which marked a 229% increase in cumulative funding compared to the previous year.

The most common beneficiaries of C-PACE funding were Mixed Use buildings ($47M), and C-PACE was most commonly used for energy efficiency improvements (93% of total funding).

STATES WITH CLOSED C-PACE PROJECTS:
AR, FL, KY, TX

PROJECT HIGHLIGHT: BUTLER BROTHERS

Although the Butler Brothers Building was a historic structure, it had fallen into disrepair and become an abandoned eyesore. Redevelopment was a costly and complicated endeavor since the capital stack didn't cover the up-front costs of efficiency and conservation measures that would save money in operating costs. TX-PACE provided a solution through PACE's low-cost, long-term financing for the sustainability equipment with no upfront cost, and flexible non-recourse nature. This appealed to tenants seeking high-efficiency facilities with low maintenance costs, and is Texas's largest PACE project to date.

PROJECT OVERVIEW

PROPERTY TYPE:
Stadium

TOTAL FINANCING:
$25 million

TERM LENGTH:
20 years

LENDER:
CLEANFUND Commercial PACE Capital

PROGRAM ADMINISTRATOR:
TEXAS PACE AUTHORITY

Source: Texas PACE Authority

PROGRESS SUMMARY

SOUTH, CUMULATIVE (2013-2017)

95

buildings improved with C-PACE

- 38 added in 2017
- 67% increase from 2016

$53 million

total invested

- $37M added in 2017
- 229% increase from 2016

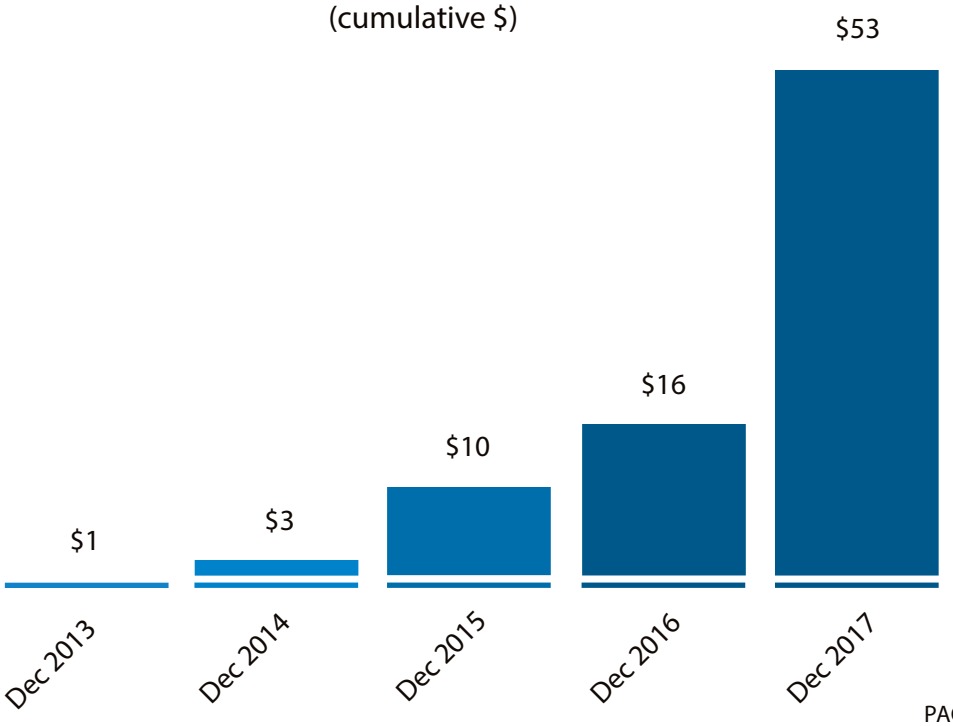
10

C-PACE programs

- 9 states C-PACE enabled
- 4 states with funded projects

C-PACE investment

(cumulative $)

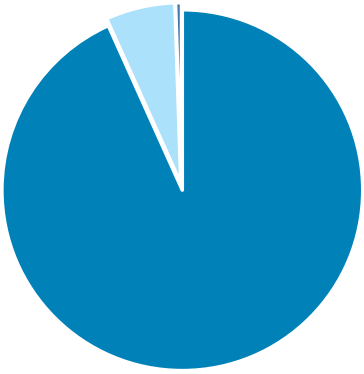


PROGRESS SUMMARY

SOUTH, CUMULATIVE (2013-2017)

Improvement types

(by $ funded)



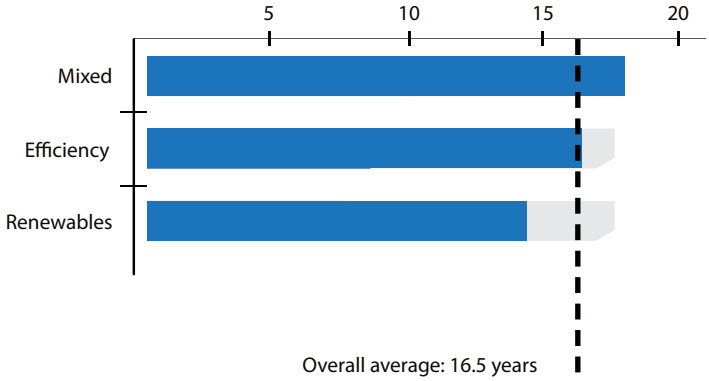
93%
energy efficiency

6%
mixed

1%
renewable energy

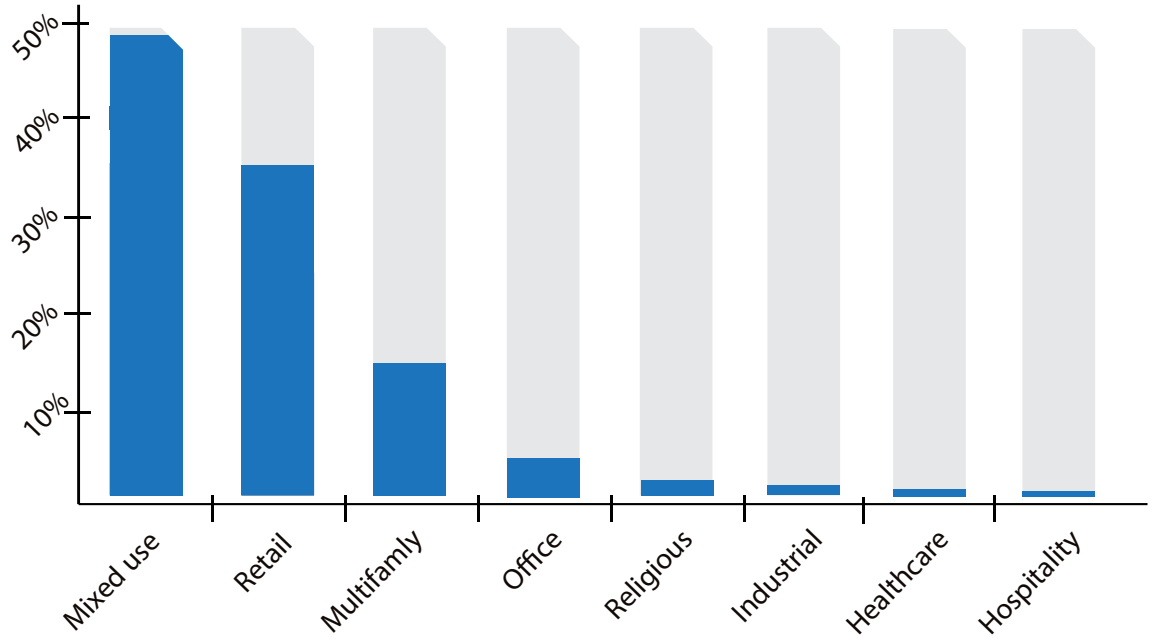
Project term lengths

(years)



Building categories

(by $ funded)



SOUTH, CUMULATIVE (2013-2017)

Economic Impacts

1. Jobs created as a result of C-PACE investments

Estimated range 580 — 790 jobs

2. Economic activity generated as a result of C-PACE investments

Estimated range $77 — $132 million

2016

120 jobs added in 2016

70% increase from 2015

2017

279 jobs added in 2017

92% increase from 2016

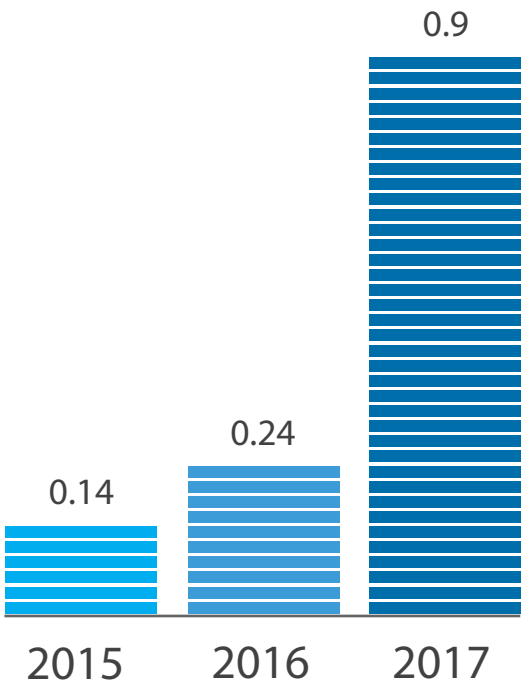
= 10

SOUTH, CUMULATIVE (2009-2017)

Environmental Impacts

Energy savings

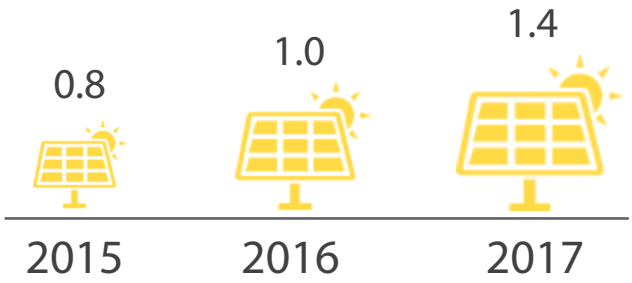
(cumulative estimated mWh, millions)



Estimated over useful lifetime of installed measures

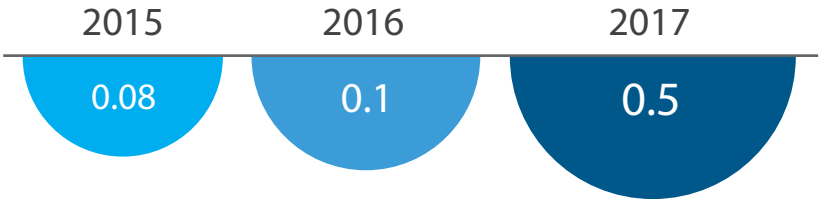
Solar capacity installed

(cumulative estimated MW)



Greenhouse gas emissions avoided

(cumulative estimated CO2e, million metric tons)



Estimated over useful lifetime of installed measures

Avoided GHG emissions equal to:

- 56,000 homes' energy usage for one year
- 111,000 cars taken off the road for one year
- 58M gallons of gasoline
- 4,000 acres of forest preserved for one year

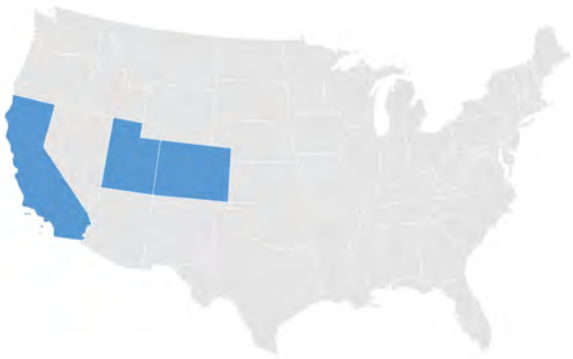

West

REGIONAL SUMMARY

WEST

The western region of the U.S. has active PACE programs with funded projects in three states — CA, CO, and UT. From 2009-2017, C-PACE programs in the region completed 830 projects, which made use of $248M of cumulative funding. In 2017 alone, $105M was funded, which marked a 74% increase in cumulative funding compared to the previous year.

The most common beneficiaries of C-PACE funding were Healthcare buildings ($43M), and C-PACE was most commonly used for renewable energy improvements (31% of total funding).



STATES WITH CLOSED C-PACE PROJECTS:
CA, CO, UT

PROJECT HIGHLIGHT: SETON MEDICAL CENTER

The largest PACE financing to date is a $40mm collaborative investment from CleanFund Commerical PACE Capital and PETROS PACE Finance to Seton Medical Center for seismic upgrades. California instituted mandatory seismic safety requirements for hospital facilities, and PACE was the best way for Seton to access capital for safety upgrades that would make them compliant with the new law. PACE met the requirements of obligations under the Master Trustee as well as the financing criteria for the property management company. The critical health and safety improvements will allow the facility to continue to provide their vital community service.

PROJECT OVERVIEW

PROPERTY TYPE:
Stadium

TOTAL FINANCING:
$25 million

TERM LENGTH:
20 years

LENDERS:
CLEANFUND Commercial PACE Capital
PETROS PACE FINANCE

PROGRAM ADMINISTRATOR:
RENEW FINANCIAL

Source: PACENation

PROGRESS SUMMARY

WEST, CUMULATIVE (2009-2017)

830

buildings improved with C-PACE

311 added in 2017

60% increase from 2016

$248 million

total invested

$105M added in 2017

79% increase from 2016

13

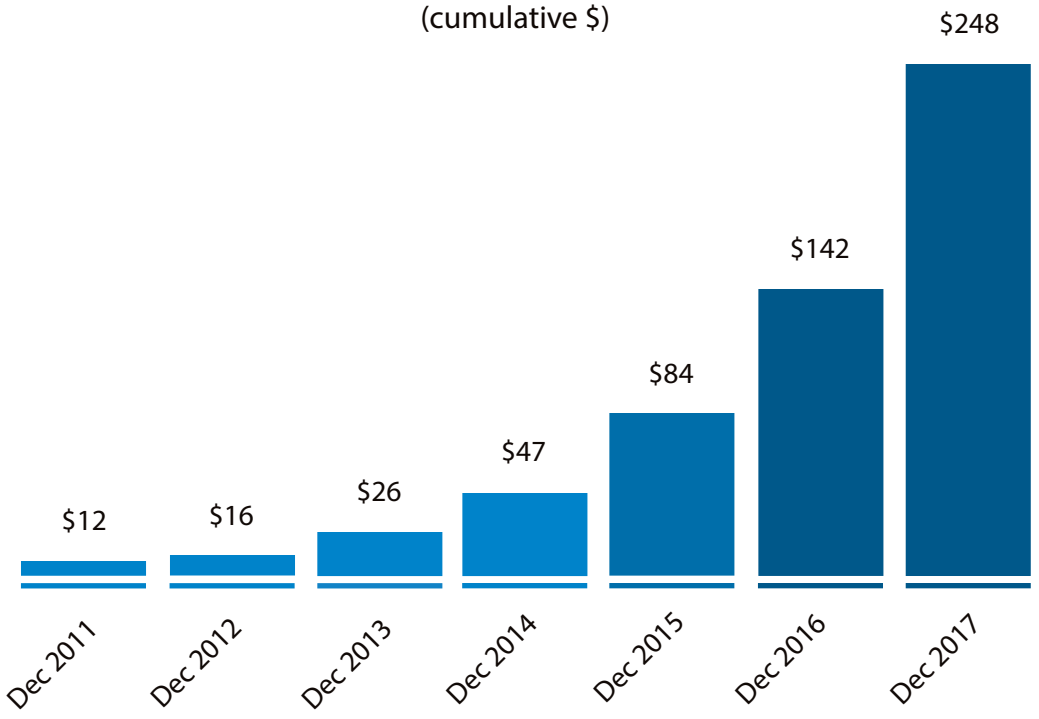
C-PACE programs

6 states C-PACE enabled

3 states with funded projects

C-PACE investment

(cumulative $)



PROGRESS SUMMARY

WEST, CUMULATIVE (2009-2017)

Improvement types

(by $ funded)

31%
renewable energy

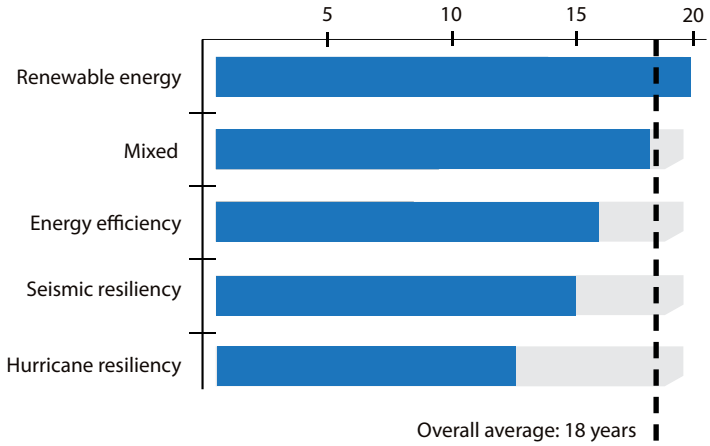
25%
resiliency

24%
mixed

19%
energy efficiency

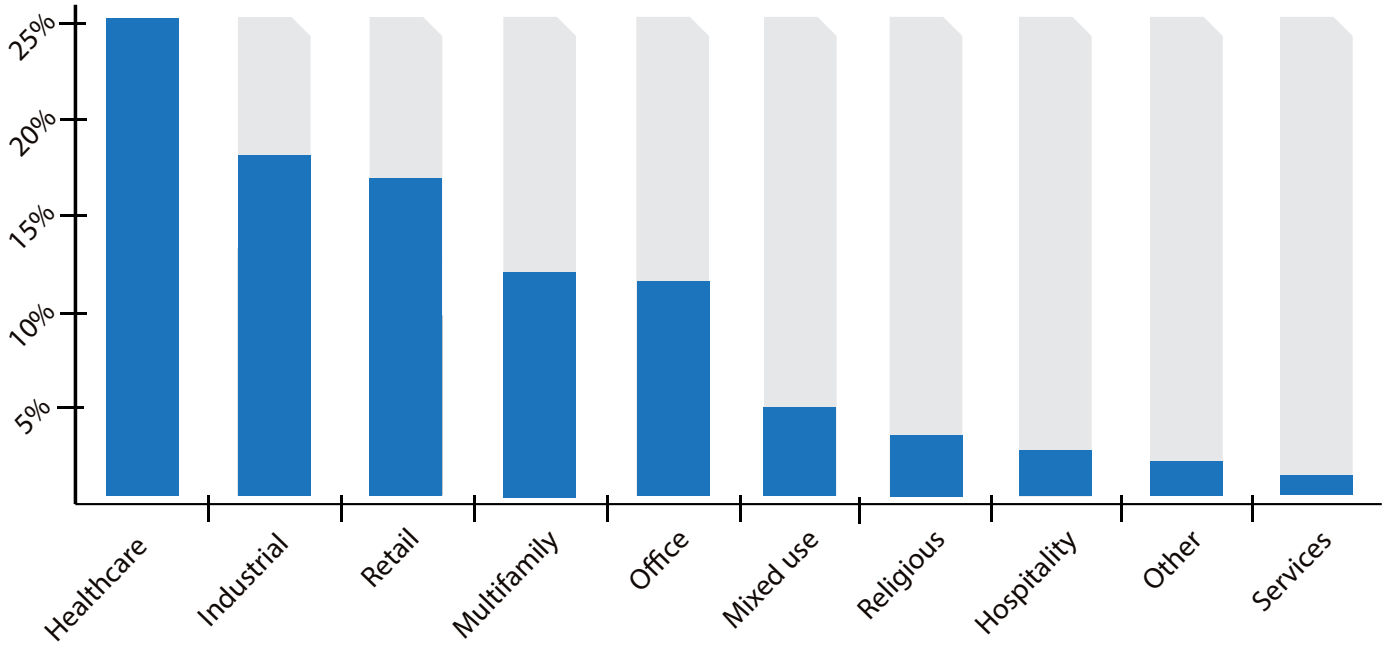
Project term lengths

(years)



Building categories

(by $ funded)



WEST, CUMULATIVE (2009-2017)

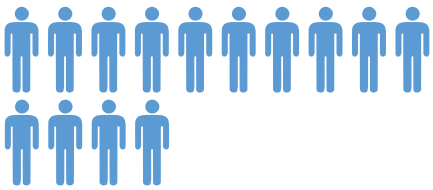
Economic Impacts

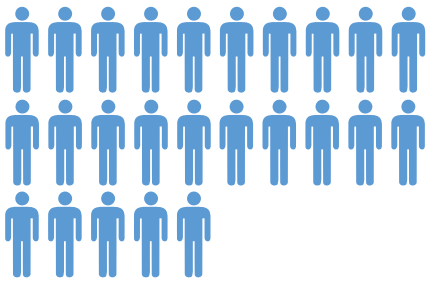
1. Jobs created as a result of C-PACE investments

Estimated range 2,500 — 3,700 jobs

2. Economic activity generated as a result of C-PACE investments

Estimated range $340 — $620 million





2016

560 jobs added in 2016

67% increase from 2015

2017

1,000 jobs added in 2017

76% increase from 2016

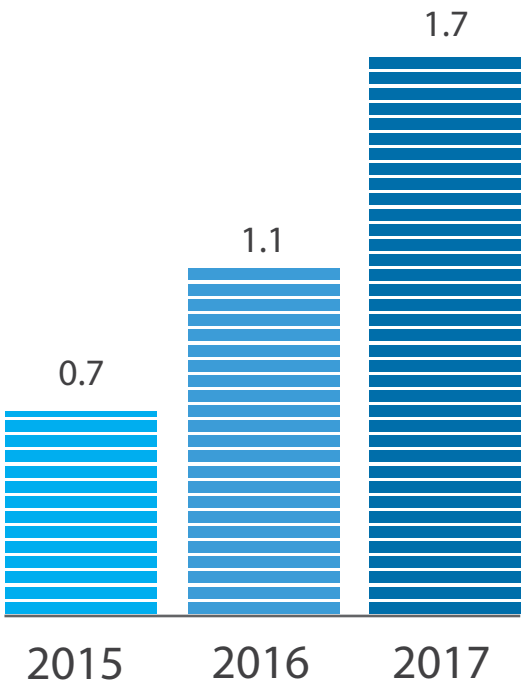
= 40

WEST, CUMULATIVE (2009-2017)

Environmental Impacts

Energy savings

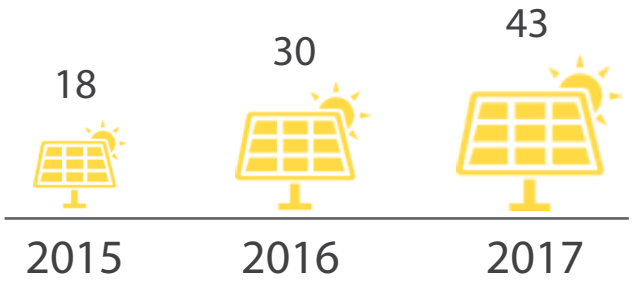
(cumulative estimated mWh, millions)



Estimated over useful lifetime of installed measures

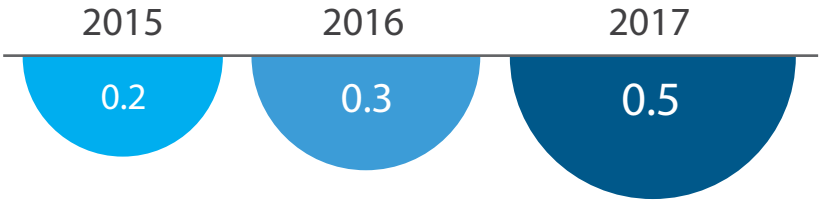
Solar capacity installed

(cumulative estimated MW)



Greenhouse gas emissions avoided

(cumulative estimated CO2e, million metric tons)



Estimated over useful lifetime of installed measures

Avoided GHG emissions equal to:

- 57,000 homes' energy usage for one year
- 112,000 cars taken off the road for one year
- 59M gallons of gasoline
- 4,000 acres of forest preserved for one year

Methodology

PACENation regularly surveys C-PACE administrators, capital providers, and other service providers on data related to C-PACE projects, including financing details, building characteristics, and types of installed measures. These data are not independently verified by PACENation, and as such, we have relied on program administrators and capital providers to report accurate data to us to generate this report.

Job creation and economic impact

This report shows an estimated range of jobs created as a result of C-PACE investments. To arrive at these numbers, two methods of calculation were used to determine lower- and upper-bound estimates.

The U.S. Bureau of Economic Analysis RIMS II economic multipliers were used to obtain estimates of job creation and economic activity for each state and U.S. region, related to investments in commercial properties. This lower-bound estimate used state-specific economic multipliers, with a combined weighted average of 9.6 jobs created per million dollars of C-PACE investment, and a combined-weighted average economic multipler effect of 1.37.

The PACENation-funded study conducted by EcoNorthwest, "Economic Impact Analysis of Property Assessed Clean Energy Programs (PACE)" was used to arrive at the upper-bound estimate of jobs created. This study analyzed residential PACE investment in four states, and found an economic multipler effect of 15 jobs per million dollars invested. While this study analyzed results from residential PACE investment, the resulting jobs multiplier was used in this report to produce a generalized upper estimate of jobs created. This study also found an economic multipler effect of 2.5.

Energy savings

This report estimates energy savings from C-PACE-funded measures based on total dollars funded per project category (incl. building envelope & insulation, control systems, doors, HVAC, lighting, roofing, water conservation, windows, and solar PV), assumed average useful lifetimes and payback periods per project category, and state commercial electricity costs.

General assumptions for average useful lifetimes and payback periods for each project category were obtained from the ASHRAE Service Life and Maintenance Cost Database, Lawrence Berkeley Lab, Pacific Northwest National Laboratory, National Roofing Contractor's Association, and conversations with PACE program administrators. Statewide commercial electricity cost data was obtained from the U.S. Energy Information Administration (EIA).

The energy savings estimates make use of an overall weighted average useful lifetime of installed measures of 12.68 years, payback period of 8.8 years, and commercial electricity costs of $0.125/kWh.

These estimates are reported as total projected energy savings over the useful lifetimes of installed measures (million MWh).

Solar capacity installed

Per-watt installed costs of solar were obtained from the National Renewable Energy Laboratory's U.S. Solar Photovoltaic System Cost Benchmark: Q1 2017. $2.13/W was used for these calculations, which includes typical installation and business operations costs. C-PACE principal investment in solar was estimated based on reported measures installed, and used to calculate total solar capacity installed (MW).

Greenhouse gas emissions reductions

Energy savings projections were used to estimate greenhouse gas emissions reductions in each U.S. region. This calculation made use of state CO2 equivalent (CO2e) emissions factors sourced from the Environmental Protection Agency's Emissions & Generation Resource Integrated Database (eGRID). Table ST14, "State Annual CO2 Equivalent Total Output Emission Rate," was used for this calculation.

These estimates made use of projected energy savings over the useful lifetimes of installed measures, and, similarly, are reported as greenhouse gas reductions over the useful lifetimes of installed measures (CO2e, million metric tons).