

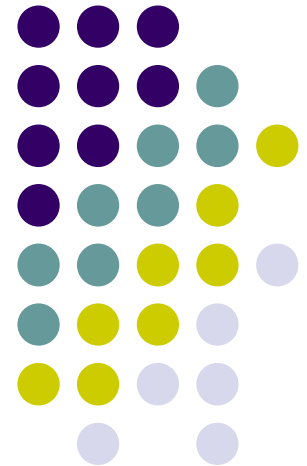
# Scottsdale 2018 Green Building and Solar Trends



## City of Scottsdale Green Building Program

March 5, 2019

Anthony Floyd, FAIA, LEED-AP, CEM  
City of Scottsdale  
Office of Environmental Initiatives





# City of Scottsdale Green Building Program

- **Established in 1998**
  - Rating criteria based on Sonoran Bioregion
- **Verification Process**
  - Building plan review, permits and inspections
- **Public Outreach**
  - Engagement with project owners, developers, architects, builders and interested citizens
  - Pre-application project meetings
  - Green Building Lecture Series
- **Periodic Updates**
  - Green Home Rating Checklist v4.0
  - International Green Construction Code (2015 IgCC) for commercial and multifamily projects





# Program Incentives

- **Scottsdale Green Building Designation**
- **Streamlined Documentation & Verification Process**
- **Technical and Permit Process Assistance**
- **Zero Application and Certification Fee**
- **Enhanced Market Niche**
  - city designation and listings
- **Promotion Material and Educational Programs**
  - web site resources, logos, certificates, job site signs, building plaque, lecture series



# Green Building Program Collaboration with other City Programs & Initiatives

1. General Plan Elements
2. Planning & Zoning Ordinances & Stipulations
3. Sensitive Design Principles
4. Energy Code
5. Water Conservation Ordinance
6. City Facility Management
7. Housing Rehab Office



SCOTTSDALE



# Green Building Lecture Series

- 1<sup>st</sup> Thursday of month
- Granite Reef Senior Center
- Average attendance - 30



## SUSTAINABLE BUILDING IN THE DESERT

SCOTTSDALE



GREEN BUILDING  
PROGRAM

CITY OF  
SCOTTSDALE  
GREEN  
BUILDING  
LECTURE  
SERIES  
2018/2019

Scottsdale  
Granite Reef  
Senior Center  
located at  
1700 N. Granite  
Reef Road  
(NW corner of  
McDowell &  
Granite Reef  
Roads)

7 to 8:30 p.m.

Free Admission

**October 4, 2018**

**The Circular Economy: Reduce, Reuse, Recycle, Reconsider & Re-imagine**

In a traditional linear economy, materials are made, used and disposed of in the landfill. In a circular economy, resources are kept in use for as long as possible to extract maximum value, then recovered to regenerate new materials. Circular economies divert waste from landfills, reduce environmental impacts, conserve energy and water, and save money. Hear about community initiatives, business efforts and what you can do to support a circular economy.

**December 6, 2018**

**Future Proofing: Carbon Neutrality & Energy Efficiency in New & Existing Buildings**

While renewable energy reduces the need to produce energy from dirty sources in the future, energy efficiency reduces the need to produce energy now. Energy efficiency is among the most cost-effective ways to reduce carbon emissions, making it a key part of fighting climate change. Learn how you can reduce environmental impacts and improve the prospects for a bright future with the buildings we live and work in.

**February 7, 2019**

**Living an Edible Landscape Life**

Come join in the conversation and be inspired to grow as urban gardeners share the benefits and how-to's of growing your own healthy food, herbs, edible flowers and fruit trees in our desert environment. Learn about our planting and harvesting seasons, as well as the importance of seed saving. Hear the latest news about ancient grains. Includes a lively, interactive food tasting experience for all ages!

**April 4, 2019**

**Radiant Cooling & Other Alternatives to Conventional Air Conditioning**

Did you know that 43% of all electricity consumed in Phoenix metro area homes is used for air conditioning? Learn about mean radiant temperatures and efficient ways to remove heat while improving thermal comfort and saving energy. Discover the advantages of radiant cooling systems and hydronic technologies.

**June 6, 2019**

**Cutting Edge Residential & Commercial Green High-Performance Buildings**

What are the technological trends and building prototypes for the 21st century? Who are the early adopters and market leaders? Come see and hear about successful innovative residential and commercial projects that exemplify principles of resource conservation, energy independence and healthy living.

# Scottsdale Building Trends 1998 – 2018

## ● Energy Efficiency

- Energy code updates with enhanced performance
- Cathedralized attics (insulation at underside of roof decks)
- Energy Star products, LED lighting and solar ready zones
- Third-party energy raters and building commissioning

## ● Indoor Environmental Quality

- Fresh air ventilation and bathroom exhaust fan auto controls

## ● Water Efficiency

- Xeriscaping and efficient irrigation systems
- High-efficiency plumbing fixtures
- Efficient hot water delivery systems

## ● Heat Island Mitigation

- Recessed entrances, shaded outdoor spaces and courtyards

## ● On-Site Solar Generation

- Growing number of solar PV installations and battery storage<sup>6</sup>



# Over 1400 Green Designated Homes from 1998-2018



Silversmith Residence - Tate Studio Architects



Eldorado on 1<sup>st</sup> Condos – Will Bruder Architects



Becker Residence – Perry Becker Architect



The Douglas Scottsdale – John Douglas Architects

# 2018 Green Building Projects

- **Single-Family**

- Custom (3 new project submittals; 3 building permits issued; 6 homes are under construction from prior year)
- Standard plans (4 new project submittals; 1 home under construction from prior year)
- Green rehabilitated homes (7 building permits issued)



Tate Studio Custom Home



# 2018 Green Building Projects

- **Townhomes and low-rise Apartments**

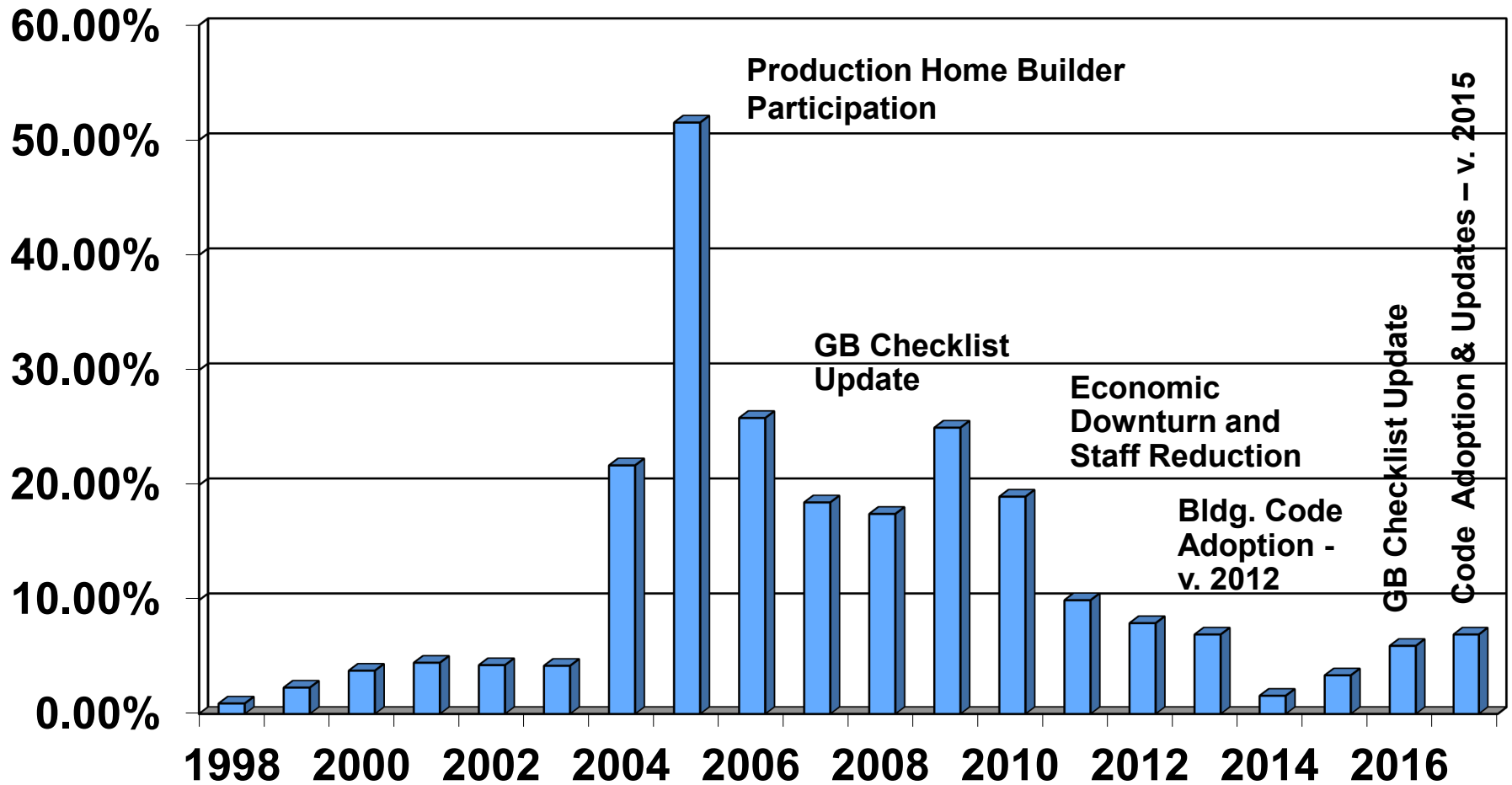
- MZ 2 (11 units) under construction since 2017
- Eclipse (20 units) under construction since 2017
- Holiday Fourplex apartments (4 units) - in review



MZ2 Townhomes - Modus Development

# Percentage of Green Single Family and Townhome Permits

1998 - 2018



Source: Scottsdale CDS records

# Green Single Family & Townhome Permits (1998 - 2018)

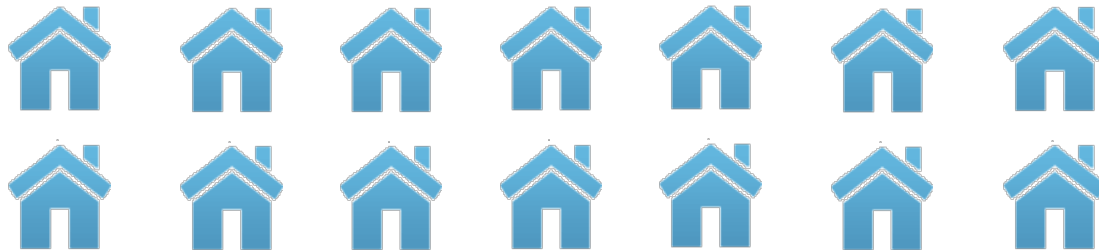
Year	Total Permits	Green Permits	Percentage of Total Permits
1998	2172	20	1%
1999	1554	36	2%
2000	1076	41	4%
2001	843	38	5%
2002	768	33	4%
2003	896	38	4%
2004	1137	247	22%
2005	852	439	52%
2006	685	177	26%
2007	573	106	19%
2008	200	35	18%
2009	121	30	25%
2010	149	28	19%
2011	155	15	10%
2012	265	21	8%
2013	400	26	7%
2014	440	7	1.6%
2015	438	15	3.4%
2016	525	29	6%
2017	560	38 (7 SFR; 31 townhomes)	7%
2018	569	10 (3 SFR; 7 rehab's)	1.8%
<b>Total</b>	<b>14,378</b>	<b>1,429</b>	<b>10.3%</b>

Source: Scottsdale CDS records

# Green House Gas Reduction as a result of 1,429 Green Homes



Annual reduction of 5,430.2 tons of carbon dioxide (CO<sub>2</sub>) equivalent to removing 1,055 cars from the streets



Source: [epa.gov/energy/greenhouse-gas-equivalencies-calculator](http://epa.gov/energy/greenhouse-gas-equivalencies-calculator)

# Energy Savings and Environmental Impact Reduction based on Average Size Green Homes

Estimated energy savings and equivalent greenhouse gas reduction resulting from houses completed under the Green Building Program.

Green Home Energy Measures	Annual Energy Savings and Pollution Reduction	
	Per Home	Total Savings for 1,429 green homes in 2018
<b>Typical <u>Small</u> Custom Home<sup>1</sup></b>	<b>2,700 square feet</b>	
<b>Average Annual Energy Reduction<sup>1</sup></b>	4,634 Kilowatt hours (kWh)	6,621,946 Kilowatt hours (kWh)
<b>Average Annual Energy Cost Savings</b>	<b>\$554.23 per year</b> (0.1196 per kWh) <sup>2</sup>	<b>\$791,994.67</b> (0.1196 per kWh) <sup>2</sup>
<b>Equivalent Annual Greenhouse Gas Reduction<sup>3</sup></b>	3.8 tons of carbon dioxide (CO <sub>2</sub> ) avoided	5,430.2 tons of carbon dioxide (CO <sub>2</sub> ) avoided
<b>Equivalent Passenger Vehicles removed from Street<sup>3</sup></b>	0.738 passenger vehicles	1,055 passenger vehicles
<b>Equivalent miles driven by an average passenger vehicle<sup>3</sup></b>	8,453 miles	12,079,337 miles

Sources: <sup>1</sup>Scottsdale Green Home Energy Study (2009); <sup>2</sup>[electricitylocal.com/states/arizona/scottsdale](http://electricitylocal.com/states/arizona/scottsdale); <sup>3</sup>[epa.gov/energy/greenhouse-gas-equivalencies-calculator](http://epa.gov/energy/greenhouse-gas-equivalencies-calculator)

# Scottsdale Commercial Projects - 2018

- **New projects complying with the International Green Construction Code (IgCC) or LEED**
  - Apple Retail Store at Fashion Square
  - Element Hotel at SkySong (157 rooms)
  - Optima Sonoran Village (176 units)
  - Vitri Apartments at Scottsdale Quarter (301 units)

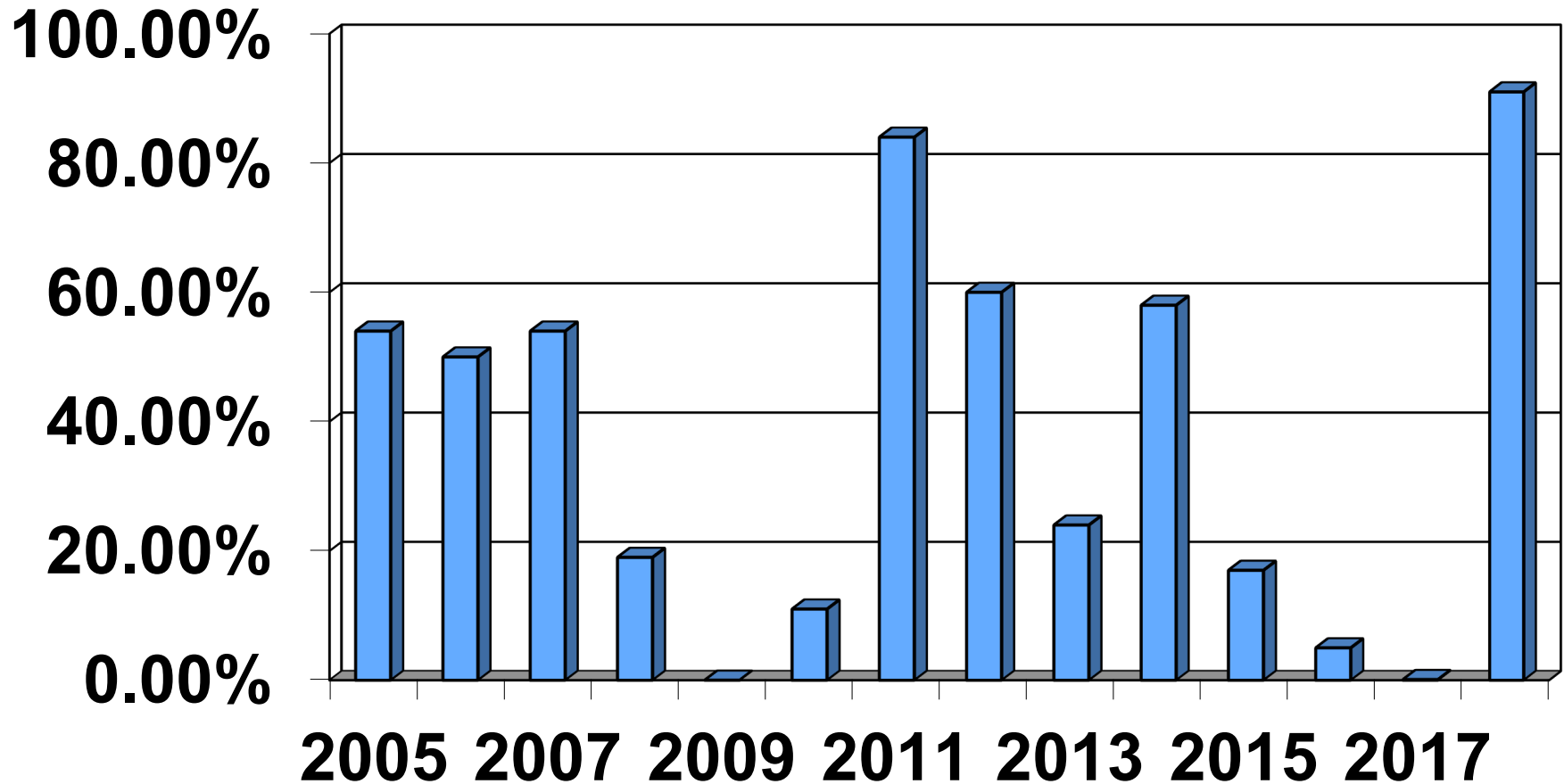


Apple Store at Scottsdale Fashion Square  
(photo credit - Corbin Gotelli)



Element Hotel at SkySong

# Percentage of Green Multifamily Dwelling Permits for Condos and mid-rise Apartments 2003 - 2018



Source: Scottsdale CDS records

## Green Multifamily Dwelling Unit Permits (2003 - 2018)

Year	Total Permits	Green Permits	Percentage of Total Permits
2003	1,500	5	<b>0.3%</b> Includes 5 units at Loloma 5 Townhomes
2004	1,025	0	<b>0%</b>
2005	483	261	<b>54%</b> Includes 253 units at Optima Camelview Village, 8 units at The Duke Earll Drive Townhomes
2006	743	373	<b>50%</b> Includes 299 Optima Camelview Village units, 74 units at Safari (non-green units include Waterfront Towers, Monterey, Barolo)
2007	621	335	<b>54%</b> Includes 198 Optima Camelview Village units, 96 at Corriente, 38 at Safari, 3 at Engle Villas Desert Park Village (non-green units include 17 at Waterfront Towers, 6 at Canavest, 6 at Hancock, 8 at Eagles Pass, 93 at Artesia, 18 at Villa Contendo, 36 at Paseo Village, 100 at Sage, 2 at Clayton)
2008	402	76	<b>19%</b> Includes 56 Optima Camelview Village units, 8 at Engle Villas at Desert Park Village, 10 at Upton, 2 at Safari (non-green units include 68 Silverstone apartments, 16 at Encore Grayhawk, 9 at Artesia, 18 at Wilshire, 7 at Courtyards at Desert Park, 2 at Hancock, 3 at Residences on Main, 203 at Classic Residences at Silverstone)
2009	24	0	<b>0%</b> (non-green projects include 5 at 6 <sup>th</sup> Street Lofts, 8 at Encore Grayhawk, 8 at Courtyards at Desert Park, 3 at Hancock)
2010	264	29	<b>11%</b> Includes 28 Optima Camelview Village units, 1 Meritage model (non-green projects include 118 at Princess Maravilla Casitas, 14 at Courtyard Desert Park, 12 at Encore Grayhawk, 80 at Ten Lofts, 11 misc.)
2011	301	254	<b>84%</b> Includes 210 Optima Sonoran I units, 44 at Optima Camelview Village (non-green projects include 39 at Princess Maravilla Casitas, 8 at Encore Grayhawk)
2012	1,024	613	<b>60%</b> Includes 325 SkySong units, 264 at Broadstone Lincoln, 24 at Corriente (non-green projects include 388 at TDI One Scottsdale)
2013	2,128	507	<b>24%</b> Includes 200 Optima Sonoran II units, 259 at Broadstone Waterfront, 48 at Corriente (non-green projects include 416 at Mark Taylor on McDowell, 369 at Portales, 303 at TDI One Scottsdale, 49 at Sage, 220 at Archstone DC Ranch, 240 at Liv North, 24 at Pinnacle Point/Eagle Pass)
2014	1,798	1,033	<b>58%</b> Includes 202 units at Optima Sonoran Village II; 267 at Scottsdale Quarter Crescent ; 556 at Clayton Apartments; 8 at Project MZ
2015	758	130	<b>17%</b> Includes 89 at Envy Condos; 41 at Equinox Apartments
2016	741	33	<b>5%</b> Includes 10 condo units at SOHO; 7 units at Eldorado on First; 16 units at Plaza Osborn Apartments
2017	1,000	1	<b>0.1%</b> - Final condo unit built-out at Envy Condos
2018	<b>524</b>	<b>477</b>	<b>91%</b> Includes 176 condo units at Optima Sonoran Village; 301 apartment units for Vitri at Scottsdale Quarter
<b>Total</b>	<b>13,336</b>	<b>4,127</b>	<b>31%</b>





# Scottsdale City Resolution for LEED Gold Certified City Buildings

14 LEED certified buildings including 4 Platinum (2005 – 2018)



Airport Operations Center – LEED Silver



Museum of the West – LEED Gold



Appaloosa Library – LEED Gold



Downtown Fire Station 2 – LEED Platinum



# Scottsdale City Resolution for LEED City Buildings completed in 2018

- Aviation Business Center (completed)
- Fire Station 613 (completed)
- Fire Stations 603 and 616 in design/permit review



Fire Station 613  
Opened in September 2018

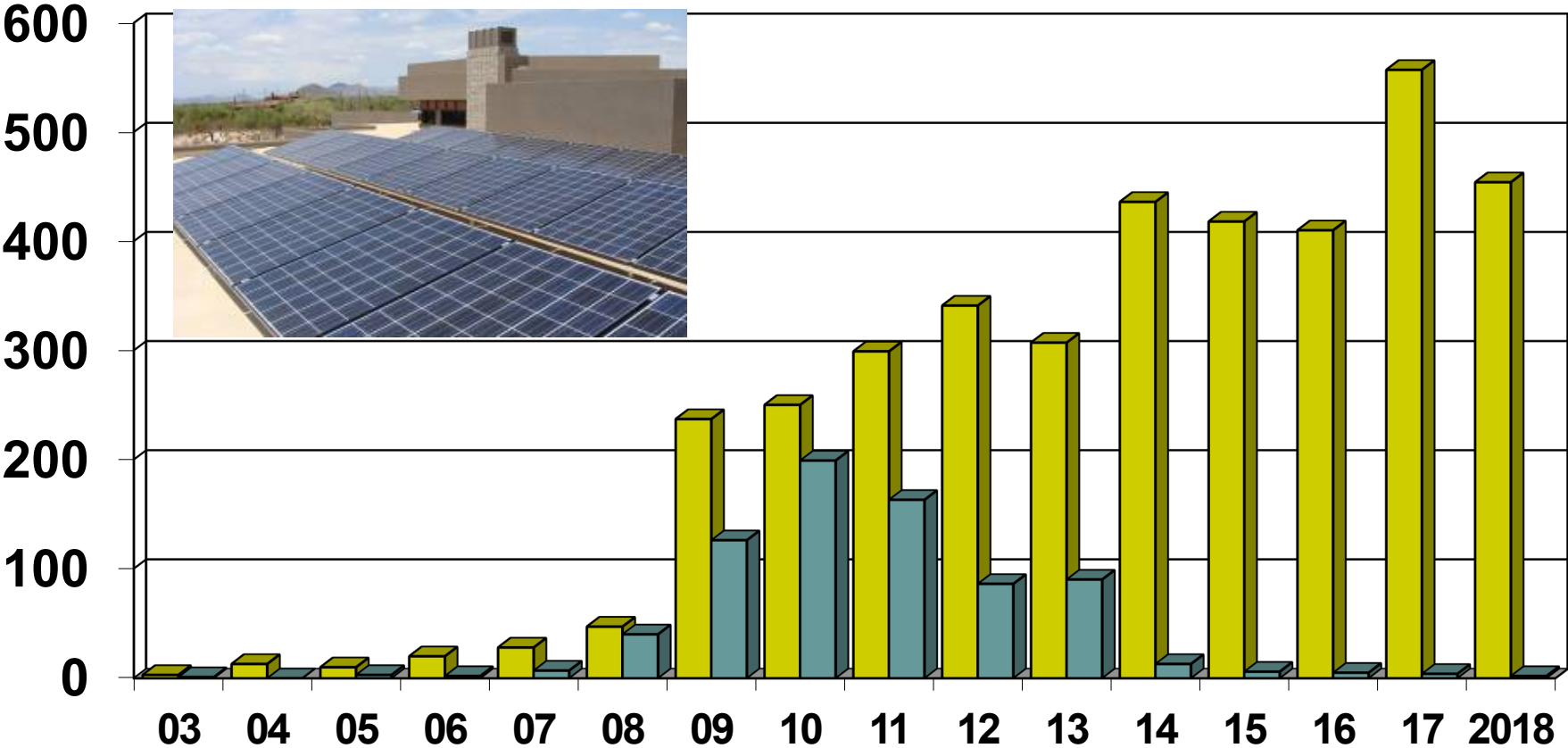


Aviation Business Center  
Opened in November 2018

# Solar Permits 2002 to 2018

**■ PV** **■ Hot Water**

Over 4,000 solar PV and hot water installations



Source: Scottsdale CDS permit records

# Solar Permits 2002 to 2018

## Solar Electric (PV)

3,832 + solar PV permits issued

Year	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
No. of Permits	2	3	13	10	20	28	47	237	250	299	341	307	436	418	410	557	454

## Solar Hot Water

747 + solar hot water permits issued

Year	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
No. of Permits	-	1	0	3	2	7	40	126	199	163	86	90	13	6	5	4	2

Note: Many early solar permits (2002 – 2008) were designated as minimum electrical, plumbing or water heater permits.

Source: Scottsdale CDS permit records

# On-Site Energy Generation and Environmental Impact Reduction of Solar Electric (PV) Systems

Estimated energy savings and equivalent greenhouse gas reduction resulting from installed roof top solar PV systems from **2002 to 2018**.

Green Home Energy Measures	Annual Energy Savings and Pollution Reduction	
	Per Home	Total Savings for <b><u>3,832</u></b> solar PV roof tops
<b>Average PV system size</b>	<b>6 kW</b>	
<b>Average Annual On-Site Energy Generation<sup>1</sup></b>	9,798 Kilowatt hours (kWh)	37,545,936 Kilowatt hours (kWh)
<b>Average Annual Energy Value<sup>1</sup></b>	<b>\$1,062</b>	<b>\$4,069,584</b>
<b>Equivalent Annual Greenhouse Gas Reduction<sup>2</sup></b>	7.6 tons of carbon dioxide (CO <sub>2</sub> ) avoided	29,123.2 tons of carbon dioxide (CO <sub>2</sub> ) avoided
<b>Equivalent Passenger Vehicles removed from Street<sup>2</sup></b>	1.5 cars	5,748 cars
<b>Equivalent miles driven by an average passenger vehicle<sup>2</sup></b>	16,503 miles	63,239,496 miles

Sources: <sup>1</sup>[pvwatts.nrel.gov](http://pvwatts.nrel.gov); <sup>2</sup>[epa.gov/energy/greenhouse-gas-equivalencies-calculator](http://epa.gov/energy/greenhouse-gas-equivalencies-calculator)  
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# Office of Environmental Initiatives

Planning and Development

Green Building Program

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