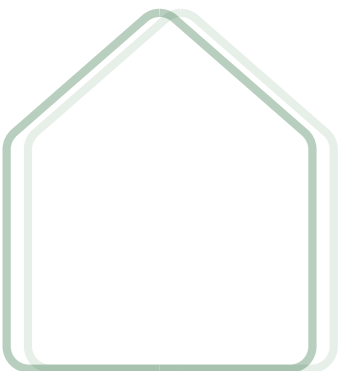


# Solar energy considerations for residential and commercial properties

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*Real Estate 651:  
Green Sustainable Development*



# **An introduction to solar energy**

- Solar panel costs continue to go down while quality and efficiency steadily increases
- SunPower, LG, and Panasonic are seen as the leading solar panel producers
- Solar panels have, on average, a generation capacity of 259 - 340 Watts
- Solar panels, batteries, charge controllers, and power inverters are the four things necessary for solar energy production

# Commercial solar installations

- Most common commercial solar systems are carports, flat roof systems and slanted roof systems

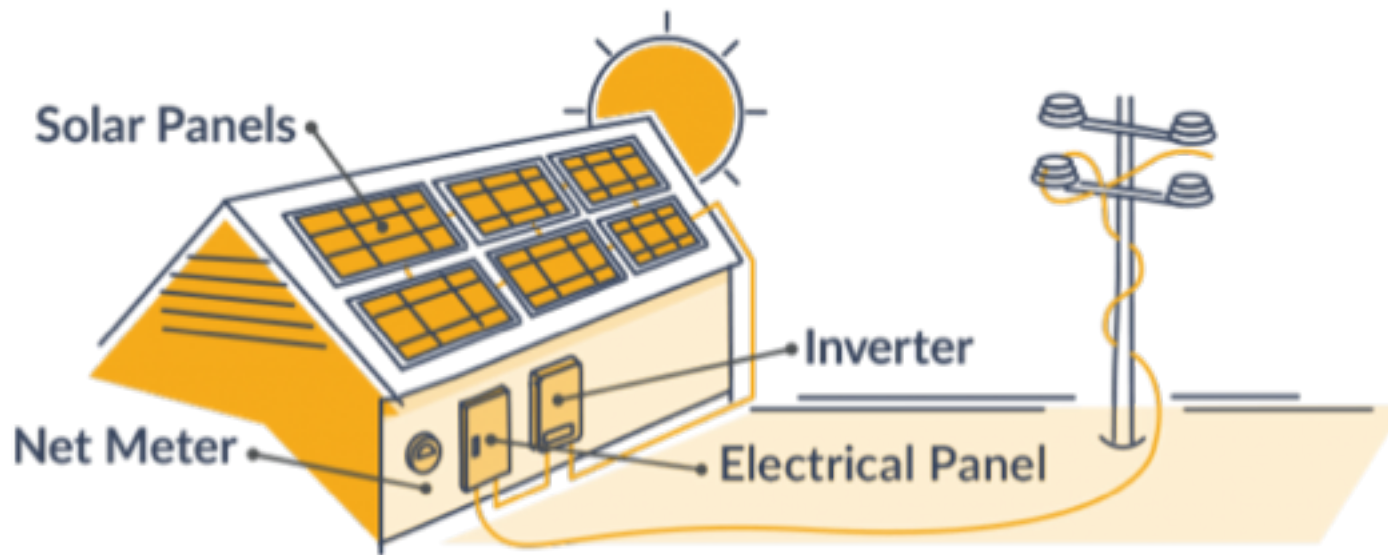


# Residential solar installations

- Becoming more common on multi-family properties
- Wide rooftops
- More cost effective than single housing units
- Sub-metered properties more complicated to manage



# How does electricity generated by the solar panels get used, and how is this integrated into the building electrical system?



# What is the "metering?"

- Single Family/ Non-Residential
- Multifamily
- Each unit gets its own microinverter
- Each microinverter is connected to separate panels

# How is a building's potential solar energy generation calculated?

- The PV watt estimation uses information about the system's location, basic design parameters, and system economics.
- The six inputs required are:
  - System DC size
  - Module type
  - Array type
  - System losses
  - Array tilt angle
  - Array azimuth angle
- DC to AC size ratio, inverter efficiency and ground coverage ratio can also be used to refine the calculation
- The cost of electricity is estimated based on system installation cost, average annual retail cost of electricity and whether the system is installed on a residential or commercial property

# **How are solar installations funded?**

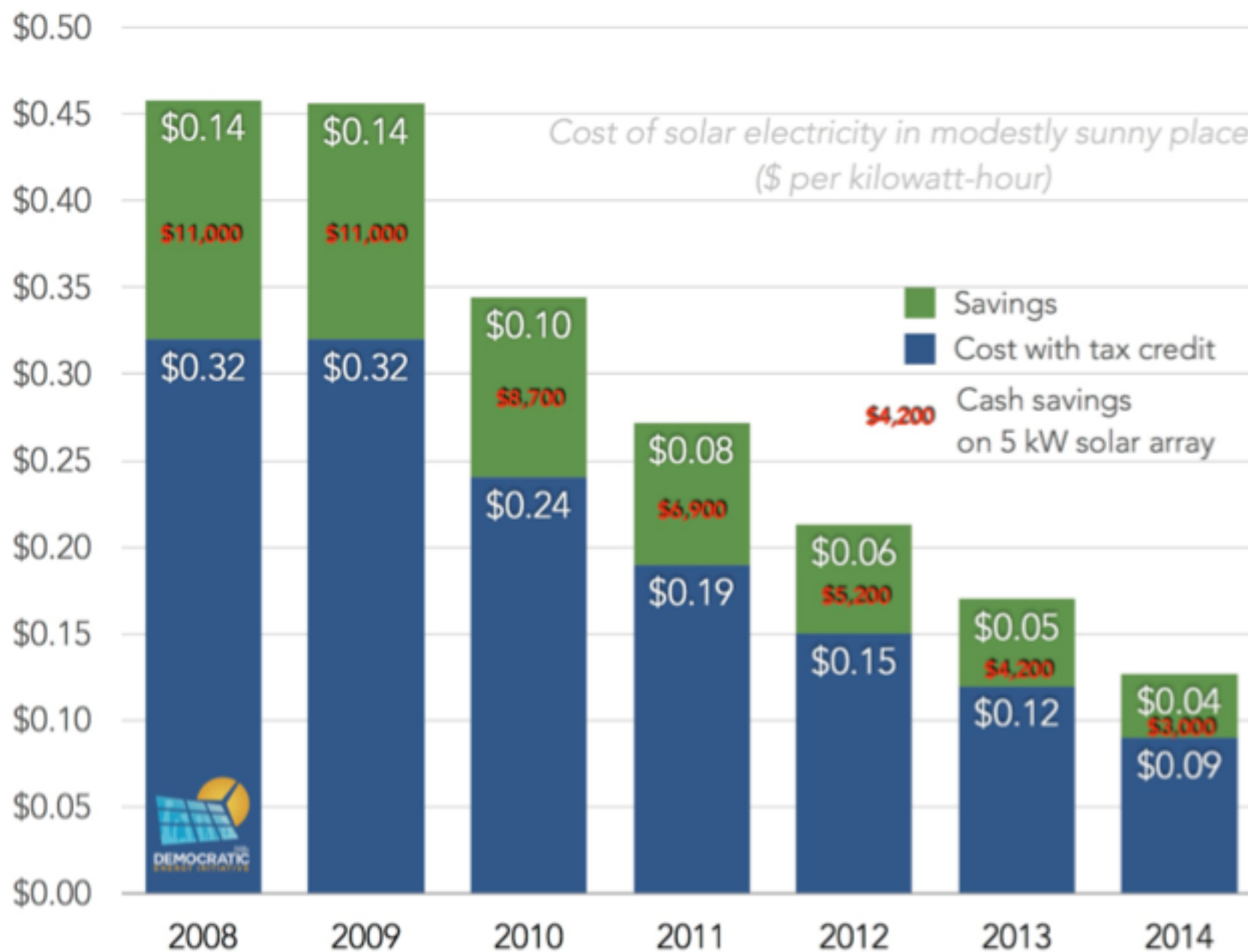
- Federal renewable energy tax credit
- PACE program
- Bank loans
- Solar investment tax credit



# **What is the federal renewable energy tax credit and how does it work?**

- The Federal Renewable energy tax credit is also known as the Federal Production Tax Credit or the PTC. It is the amount of electricity that is made from eligible renewable energy facilities, which cause efficiency and creativity to maximize production.
- The federal renewable electricity production tax credit is an inflation that is adjusted per-kilowatt-hour tax credit for electricity generated by the various qualified energy resources and sold by the taxpayer to an unrelated person during the year.
- Federal tax credits for renewable energy are necessary to provide more equality in the tax code with fossil fuels and nuclear power.
- Federal tax credits are a key driver of renewable energy development.

# VALUE OF 30% FEDERAL TAX CREDIT



# **Is PACE an option?**

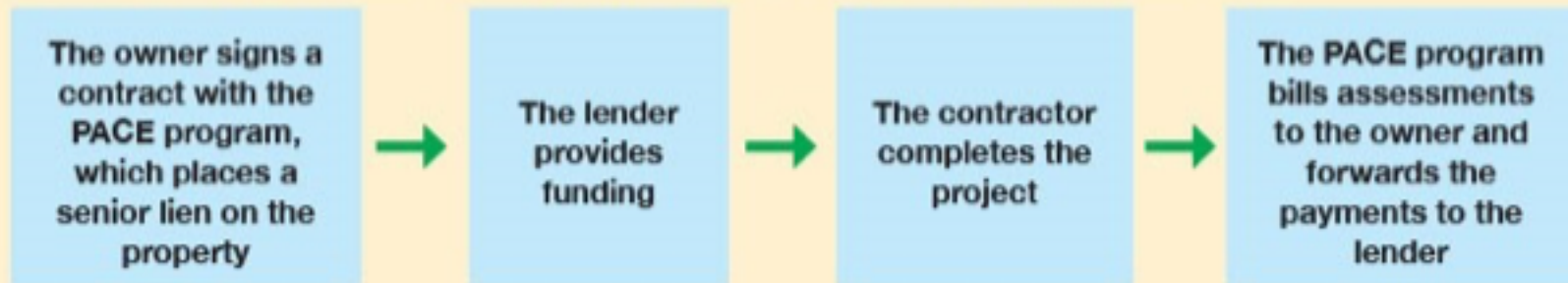
- Property Assessed Clean Energy (PACE)
- A means of financing energy efficiency upgrades or renewable energy installations
- Available to residential, commercial and industrial property owners

# How does the PACE program work?

## **A building owner:**



## **If the owner, building and project all meet PACE requirements:**



# **What are the benefits of PACE?**

- Reducing local greenhouse gas emissions
- Promoting energy efficiency improvements in buildings
- Making the shift to renewable sources of energy more affordable
- Reducing energy costs for residents and businesses
- Funded through private lending or municipal bonds, it creates no liability to the city's funds
- Made possible through private capital to source financing

# What are the limitations of PACE?

- Eligibility is based primarily on property information rather than income and FICO scores.
- A homeowner's ability to pay is based on their mortgage, property tax payment history. recent bankruptcies are permitted.
- Homeowners are financed for the home improvements without considering whether the financing is affordable for the homeowner.

# What are other funding options?

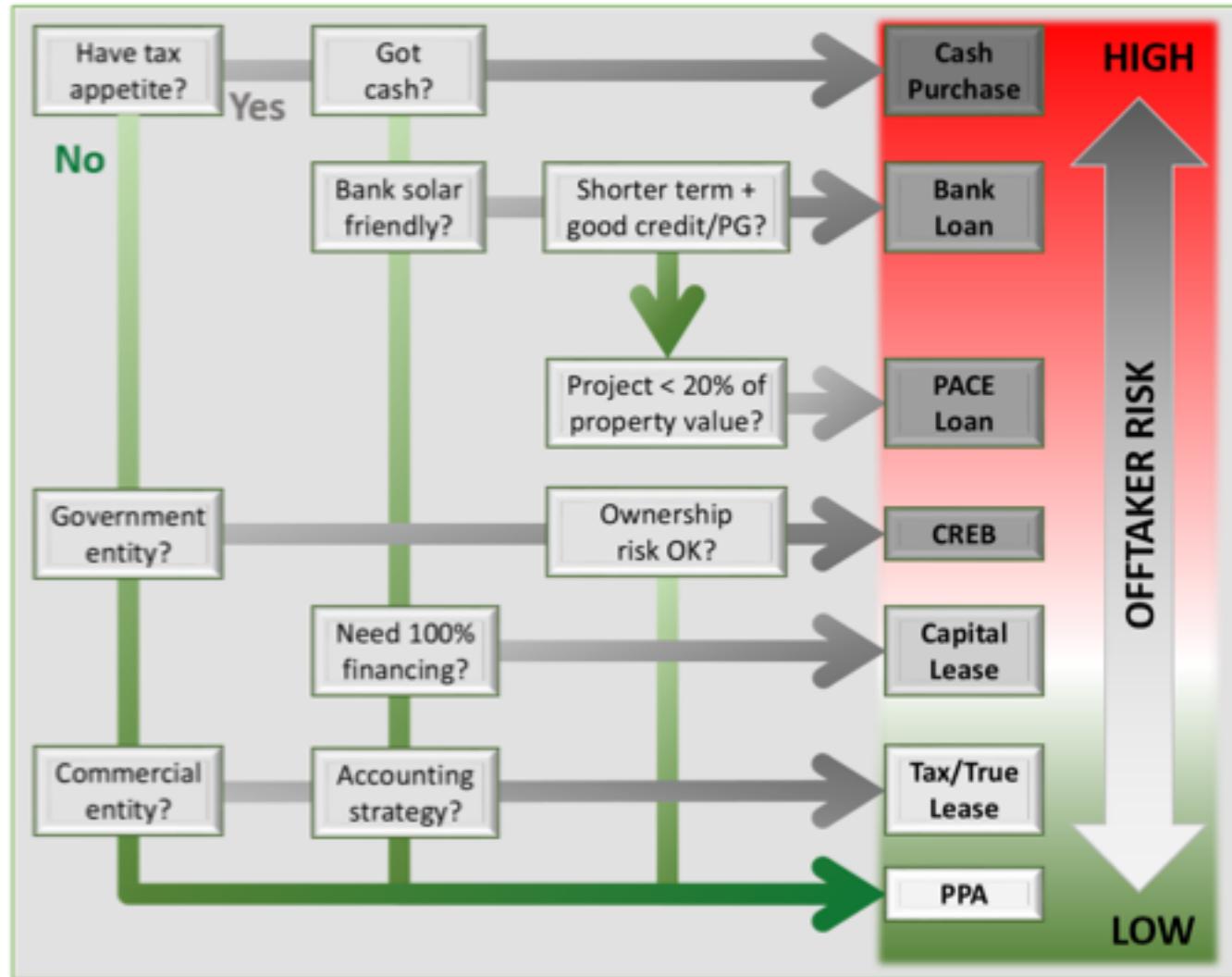


Image source:  
<https://heliopower.com/energy-finance-services/solar-project-finance/>

# How do other options work?

- Without cash, developers use bank loans or their mortgage
- Difficulty arises due to transferability of cost and useful life of panels
- Requires finding a loan term >20 years or taking advantage of tax credits
- The Solar Investment Tax Credit (ITC) grants developers 30% of total project cost as an upfront credit and can be combined with LIHTCs<sup>1</sup>

<sup>1</sup> **CPA Firm Novogradac:** <https://www.novoco.com/periodicals/articles/current-ten-things-know-when-combining-renewable-energy-and-low-income-housing-tax-credits>



## **What are the typical costs and payback period?**

- 51,000 KW project in Fitchburg, WI
- Solar installation cost \$153,000. After a \$4,000 energy grant the cost decreased to \$149,000.
- The payback period for this project was 8 years.
- The average payback period in the United States is 6 to 8 years.

# What are the average energy costs for apartments using electric and gas?

- 1 bedroom
  - 239 kWh usage
  - \$56/month costs
- 2 bedrooms
  - 419 kWh usage
  - \$76/month costs
- 3 bedrooms
  - 656 kWh
  - \$108/month
- Averages calculated from usages and costs of complexes in Madison, WI:
  - Hub
  - Lucky
  - Constellation
  - Palisade
  - Equinox



## About UniverCity Year

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UniverCity Year is a three-year partnership between UW-Madison and one community in Wisconsin. The community partner identifies sustainability and livability projects that would benefit from UW-Madison expertise. Faculty from across the university incorporate these projects into their courses with graduate students and upper-level undergraduate students. UniverCity Year staff provide administrative support to faculty, students and the partner community to ensure the collaboration's success. The result is on-the-ground impact and momentum for a community working toward a more sustainable and livable future.

### UniverCity Alliance

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