



Solar Energy: Where are we headed?



Rebecca Cantwell
Executive Director
Colorado Solar Energy Industries Association
rcantwell@coseia.org





What we plan to cover in tonight's class



- How Solar Energy Works
- What Are the Economics of Solar
- How Much Solar does Colorado Have
- Why Solar is Growing More Popular
- How You Can Go Solar
- Policies Impacting Colorado Solar
- How You Can Get Involved in a solar future



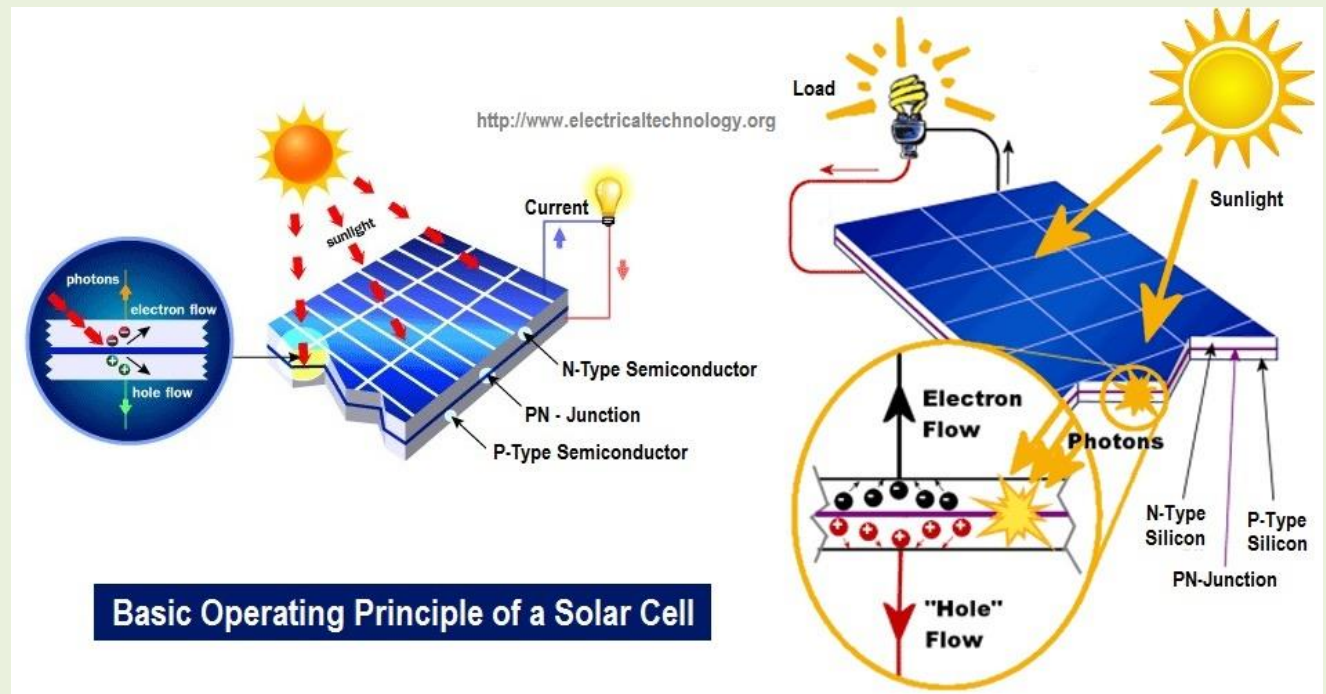
PV (Photovoltaic) Energy involves direct conversion of sunlight to electricity

-Silicon wafer has
an electric field:
positive on one side
and negative on the other.

-Light knocks
electrons loose

-Conductors are
attached to both
sides, forming an
electrical circuit.

-Electrons captured
as electric current.





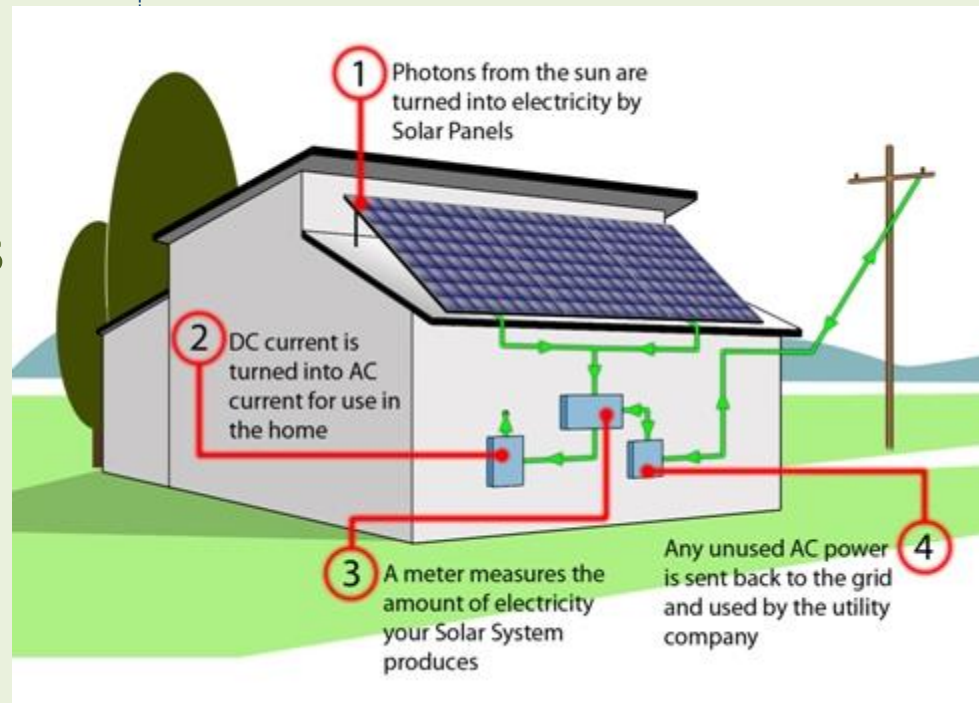
COSEIA

COLORADO SOLAR ENERGY INDUSTRIES ASSOCIATION

Solar electricity can be used in the home or exported to the electrical grid

• Typical Rooftop Array

- Typical Rooftop Solar systems generate when sun is shining
- Amount generated feeds home and excess goes to the electrical grid
- “Net metering” allows solar homeowner to receive credit for excess

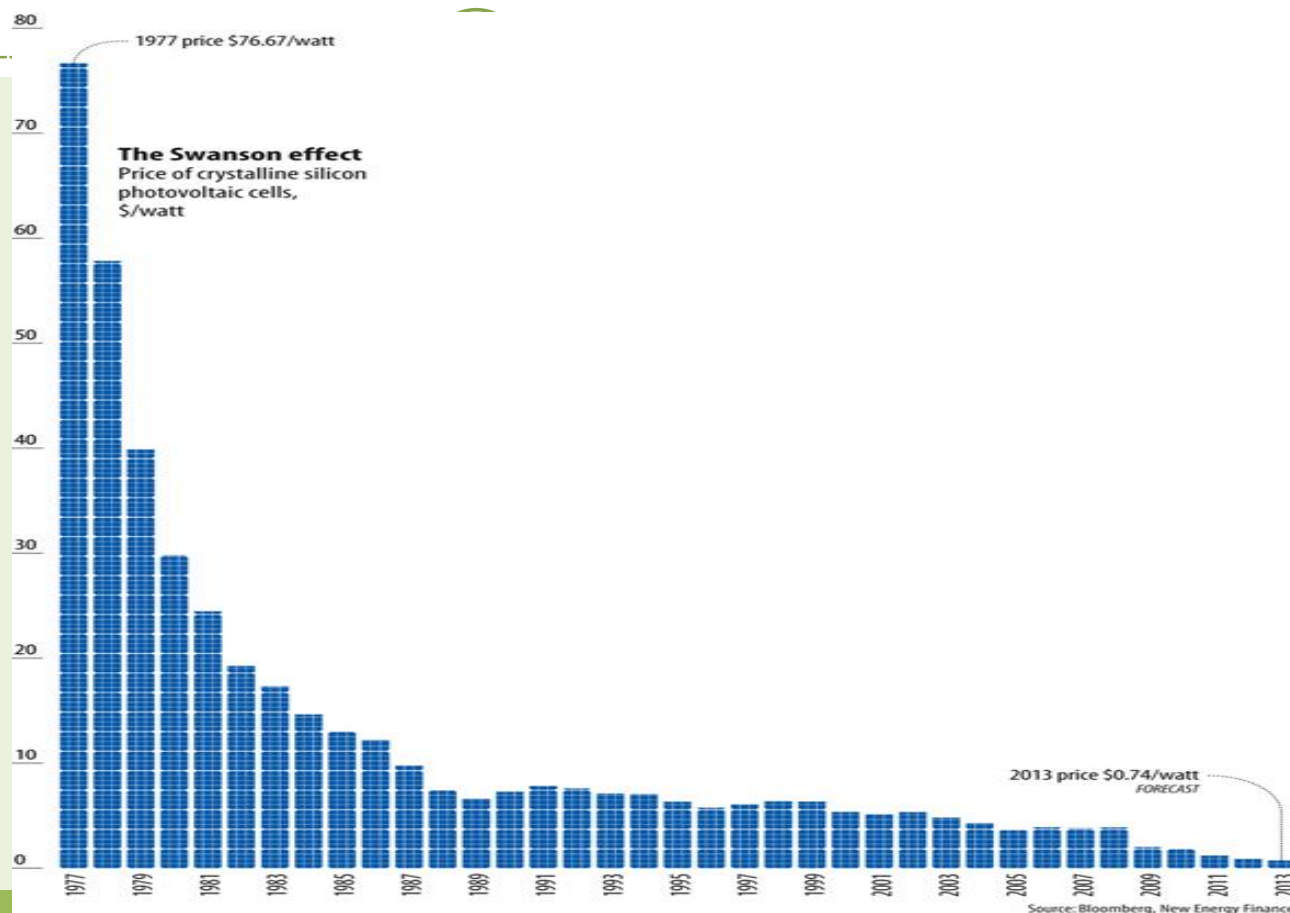


www.caplor.co.uk



What's Driving Solar Energy Growth?

The cost of solar cells today is about 100 times lower than the cost of solar cells in 1977.





Solar is a unique energy source

- Solar Photovoltaics are almost unique in that they do not use fuel to drive a turbine
- Solar PV has no moving parts and simply makes electricity
- Solar PV is remarkable because it works at nearly every scale, from chargers for cell phones to huge utility-scale arrays
- It emits no carbon and uses no water

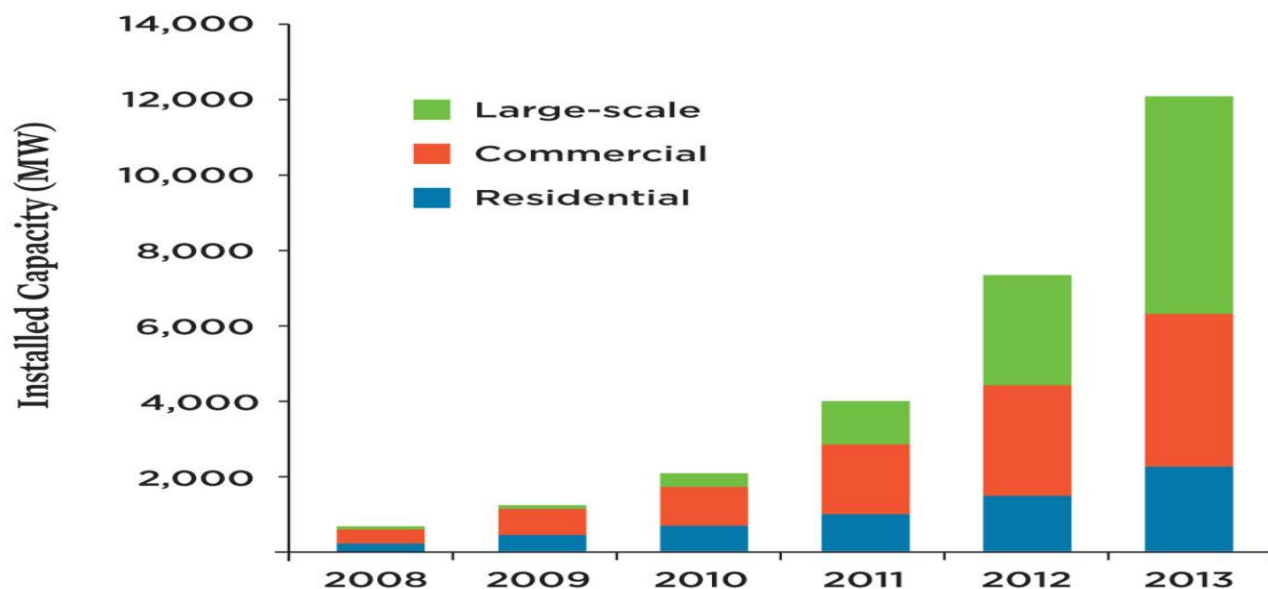




Solar Growing Fast in All sectors of U.S.

The national solar Market includes Large utility-scale Projects like power Plants, commercial Projects on businesses and stores, and residential rooftop projects

FIGURE 5. The Growing Scale of Solar PV by U.S. Sector, 2008–2013



Solar PV is experiencing impressive growth in the residential, commercial, and large-scale sectors, with the total 2014 year-end capacity projected to be 2.5 times that of 2012. For CSP, 2014 is projected to be the largest year in history (GTM Research and SEIA 2014b).

SOURCE: GTM RESEARCH AND SEIA 2014A.

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www.ucsusa.org/solarpowerontherise



Colorado has a Sunny Solar Market

- Colorado has more than 400 solar companies at work in all aspects of the industry, employing 5,000 Coloradans
- Colorado now ranks 12th in the nation Installed solar capacity, with 997MW Installed or enough to power 200,000 homes.
- COSEIA has called for A Million Solar Roofs, or 3 GW, by 2030

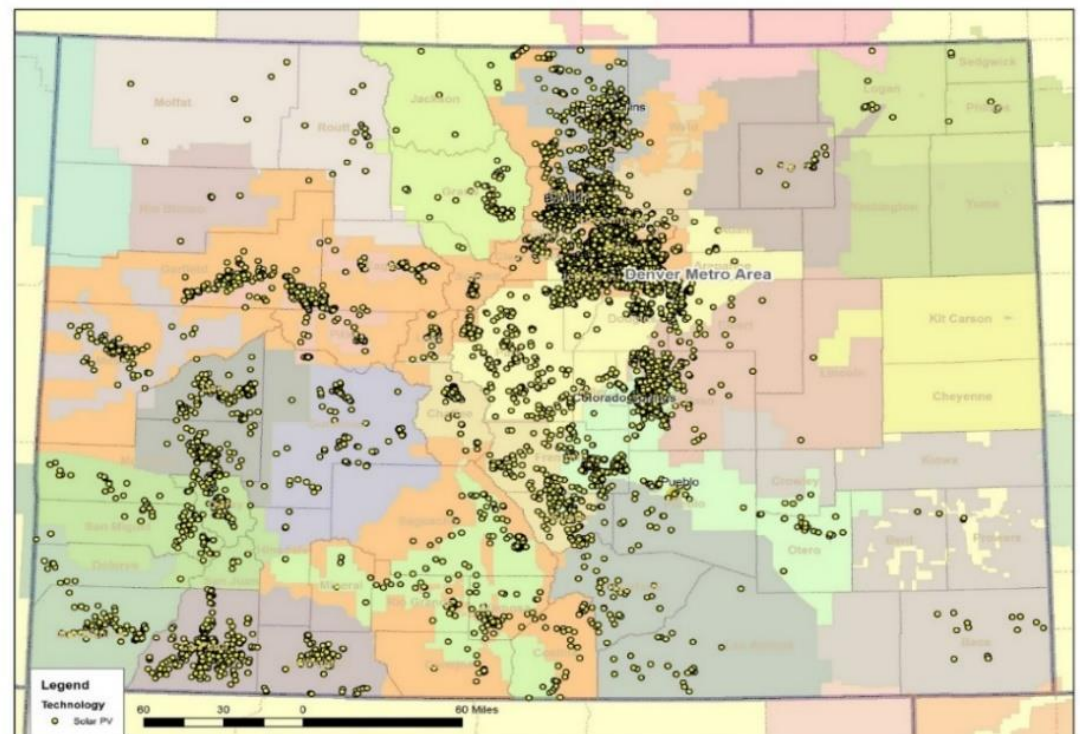




Where is Solar PV Installed in Colorado?

Nearly 30,000 PV systems installed throughout Colorado according to recent effort funded by the Colorado Energy Office

Map produced by: **ANTARES** Group Incorporated

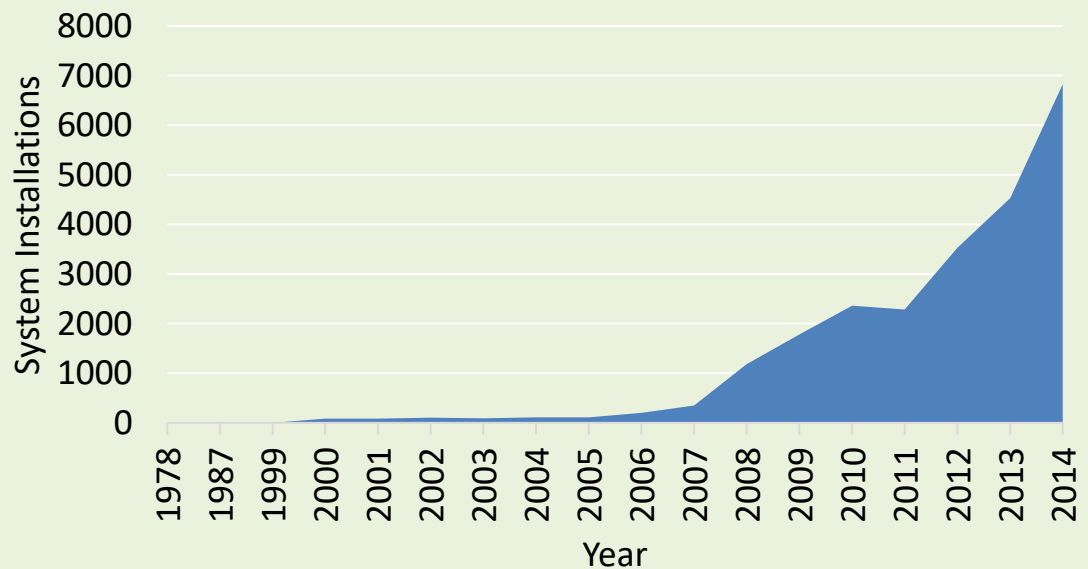




Solar Starting to Scale

The growth of solar has been driven by falling prices, favorable policies and innovative business offerings. But solar still only Represents about 2% of Colorado's Electricity mix

Annual Solar PV System Installations in Colorado



Source: Colorado Energy Office



Colorado was an early solar leader

- Colorado voters became the first in the nation to pass a renewable energy requirement by a citizen initiative, Amendment 37, in 2004
- The 10% RPS requirement of the amendment was boosted twice in the legislature and is now 30% by 2020 for Investor-Owned Utilities such as Xcel Energy
- Under the Ritter Administration dozens of laws were passed to encourage renewable Energy development





Lower prices Driving Expansion

- Installed system prices have fallen 18% in past year in Colorado. Nationally, prices dropped 45% by 2010.
- COSEIA has worked on bringing down “soft costs” and has certified 18 Solar Friendly Communities, representing nearly 3 million Coloradans
- Incentives in Colorado are gliding down
Currently 2 cents per kwh for customer-owned rooftop systems
& 1 cent per kwh for leased.
(GTM Research, U.S. Residential Solar Financing 2015-2020.)





Variety of business models make solar accessible to nearly all



- Buying your own system is growing more affordable with low interest financing packages available
- Third Party Leases have grown popular in recent years with some companies offering lease payments less than the monthly utility electric bills.
- Colorado Public Utilities Commission upheld full retail Net Metering last fall after two year inquiry
- It pays to check with multiple providers or with COSEIA's partner Energy Sage for comparative quotes at <https://www.energysage.com/coseia-sfc/>





Community Solar: Made in Colorado

- Colorado passed first law allowing solar gardens in 2010
 - 14 solar gardens now operating
 - New law allows subscribers from contiguous counties
-
- Xcel recently approved nearly 30MW of community solar in Adams, Arapahoe, Boulder, Conejos, Douglas, Garfield, Jefferson, Logan, and Summit counties





Utility Scale Solar is Approaching Grid Parity



- Xcel Energy contracting for 120 MW solar plant near Comanche in Pueblo because the price is right, competitive with gas

A Nevada utility owned by Warren Buffett will pay 3.8 cents per kWh for a solar plant's output --may well be cheapest electricity anywhere in the U.S.

(Bloomberg)

- Energy Storage is starting to come into play: Navigant Research expects global installed energy storage to grow from 538 MW in 2014 to 21 GW in 2024., and revenue will increase from \$675 million in 2014 to \$15.6 billion in 2024.





Solar Thermal and Rural Markets Showing Promise



- A law passed last year grants coops more flexibility in meeting their distributed generation requirements, including solar gardens
- Thermal solar continues to be a neglected yet valuable technology.
- COSEIA and Colorado Energy Office Working on Solar Thermal Pilot Project to develop solar heating systems for Rural residents and businesses





Solar Interest is Strong, but Warning Signs are Flashing



- Steady deployment is throttled with market ups and downs related to stop and starts in utility, state and local programs
- Big looming issue in Colorado: What is the role of the utility?
Should it own and control most renewable energy?
Or be a platform encouraging many providers?
- Different utility models emerging:
“Company Store vs. Community Store”





Just in the last few months, we've seen these challenges:

- Proposals from Xcel to add a new “Grid Access Charge” while Charging less for energy used
- A “rapid disconnect” requirement that will add about \$1,200 per system
- In Jeffco, where demand for solar is high, Xcel says the grid is full
- The state's biggest coop, IREA, adopted an anti-solar rate





Colorado can maintain solar leadership

- Targeted programs for low income residents
- Fix the broken commercial solar market
- Use rates to compensate solar for peak generation
- Unleash artificial market barriers and caps
- Make sure RECS are given their proper value
- Continue work on soft costs





Reasons for Going Solar are all Around

Threat of catastrophic climate change leading to actions:

- Clean Power Plan
- Strong moral call to action From Pope Francis
- 198 Nations reach historic climate accords in Paris
- Economic opportunities of clean energy revolution growing clear





What We Need are More Solar CitiSuns!

- 80% of public wants more Solar but few know what they can do
- New online community to promote learning, sharing and Understanding of solar energy
- All you have to do is sign up at CitiSuns.org!





Questions?

Please visit us at:

COSEIA.org
SolarCommunities.org
CitiSuns.org

