Plug-In Solar: Opportunities for Energy Assistance

Presentation to the California
Low Income Oversight Board
June 2026

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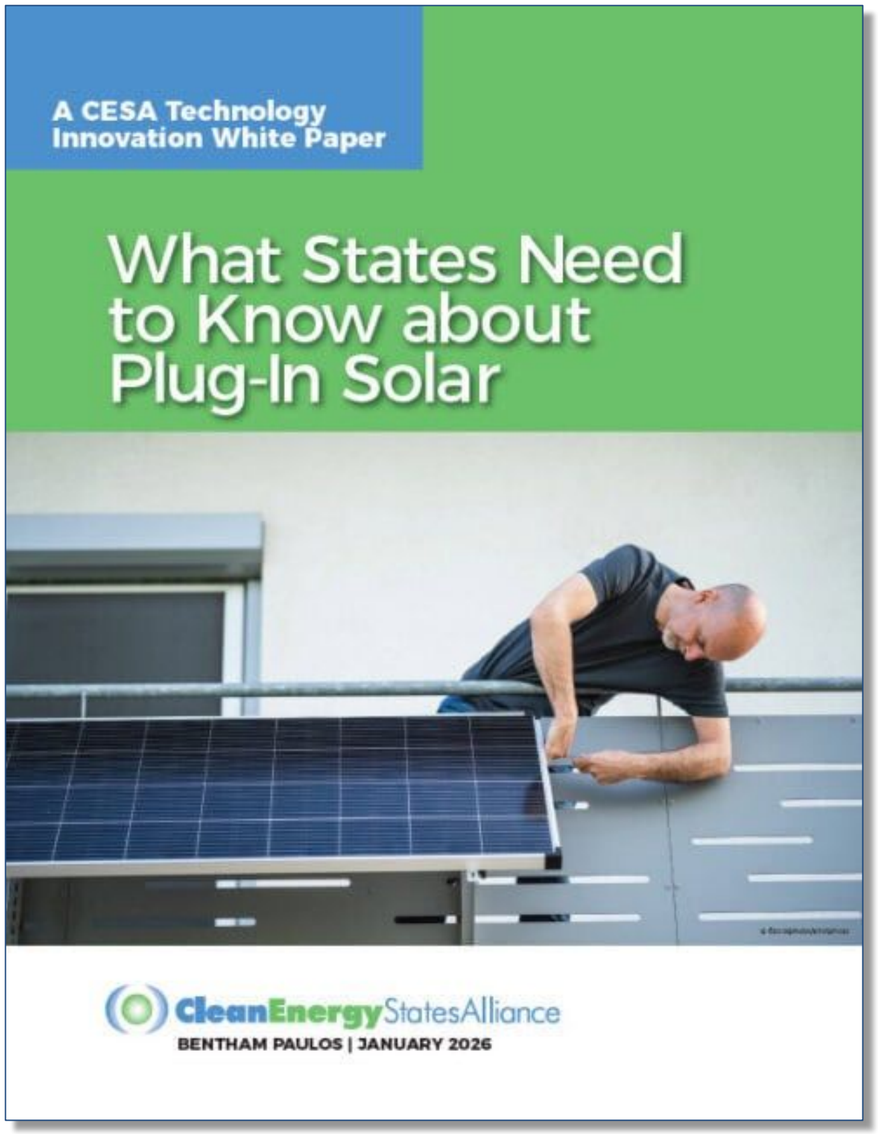
CleanEnergy States Alliance



www.cesa.org/resource-library/resource/plug-in-solar/

About

The **Clean Energy States Alliance (CESA)** is a bipartisan US coalition of 22 state energy agencies working together to advance the rapid expansion of clean energy technologies and bring the benefits of clean energy to all.

cesa.org

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paulosanalysis.com

Other CESA Resources

- Lessons Learned from Puerto Rico's First Virtual Power Plant
- Directory of State Low- and Moderate-Income Clean Energy Programs
- "How to Make Solar for All a Reality": Summary of Opportunities for Funders and Allies
- Meaningful Household Savings: Best Practices for Achieving Equitable Solar Development
- A Directory of Solar Consumer Education Resources
- Solar Equity Digest
  - This monthly newsletter includes news and resources from around the country on bringing the benefits of solar electricity to low- and moderate-income communities.

cesa.org

Overview

- What and why
- Global and US status
- Safety issues
- Regulatory issues
- Economics
- Market dynamics
- My field research
- Pathways, roles for states

What and Why?

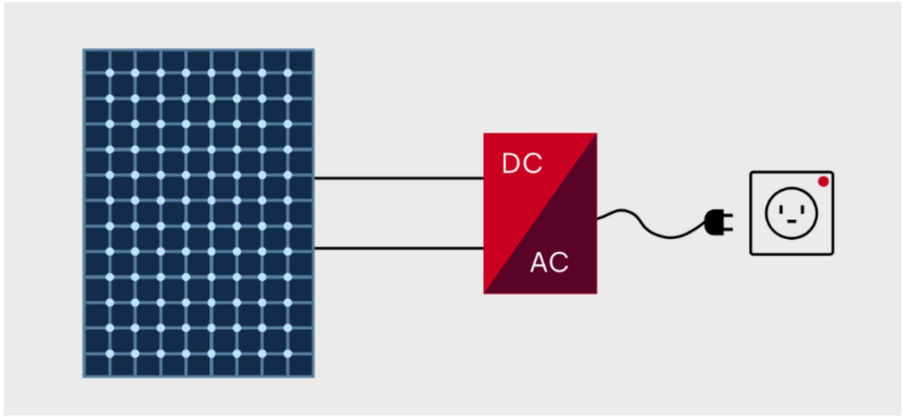
What

- Small systems, 120v output, plugged into existing AC outlets
- Installed by customer (DIY)
- No or few permit and interconnection requirements
- Marketed as a consumer appliance

Why

- Reduce cost of solar, especially soft costs
- Increase participation
- Cut household bills
- Generate clean power

Figure 1: The basic plug-in solar concept



Global and US Status

Europe

- Regulatory system established
- Marketers are active
- Germany: 1 million registered, maybe ~4 million installed

US

- Legal status not clear
- DIY community
- Growing advocacy movement and legislative interest

Bills bills bills

Mint: progress
Yellow: deferred

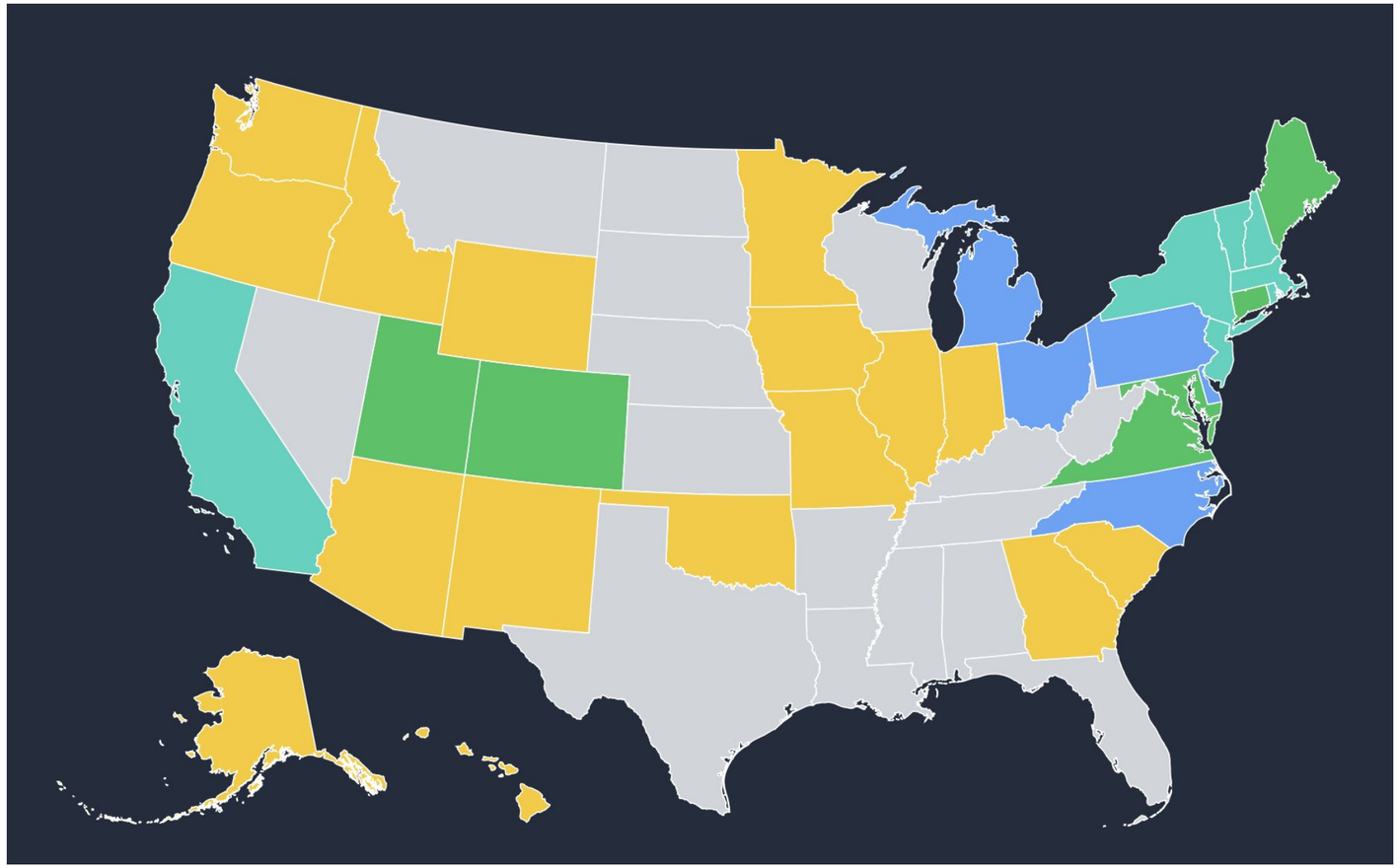
Blue: introduced
Grey: no activity

33 introduced in 2026

Six enacted
- Utah, Maine, Virginia, Colorado, Connecticut, Maryland

CA SB868 passed Senate, passed Asm comte June 10

CA AB2612 passed Asm (building codes)



Source: pluginsolarguide.com

Safety Issues

Three key issues:

1) Touch safety
2) Circuit overload
3) Ground fault protection

UL testing & certification

- Panels and inverters already covered (like anti-islanding).
- New protocol (UL3700) for testing the “system,” not just components.
- Not an official standard, but done quickly to create “pathway to market.”
- UL is open to input.

DOE / LBL research coming

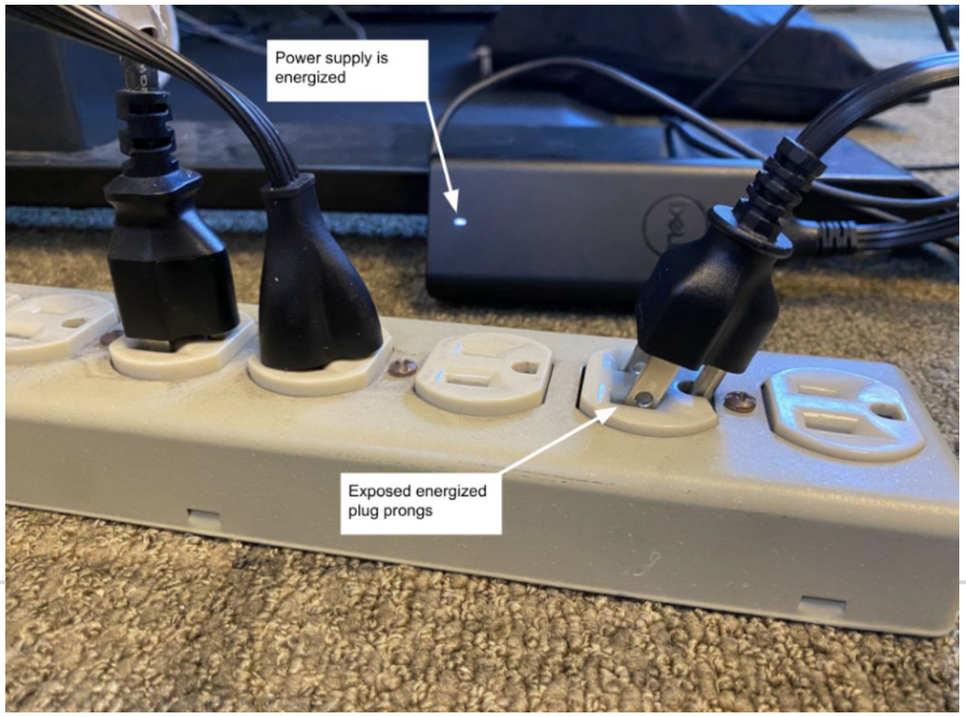
a. Touch safety

Panels generate power in the sun -- only if connected to a circuit.

Plug could be touched while partly inserted.

Standard US 3-prong plug has poor touch safety. EU plug is better, so are solar cables

UL would like a special plug and receptacle with better touch safety



b. Ground fault protection

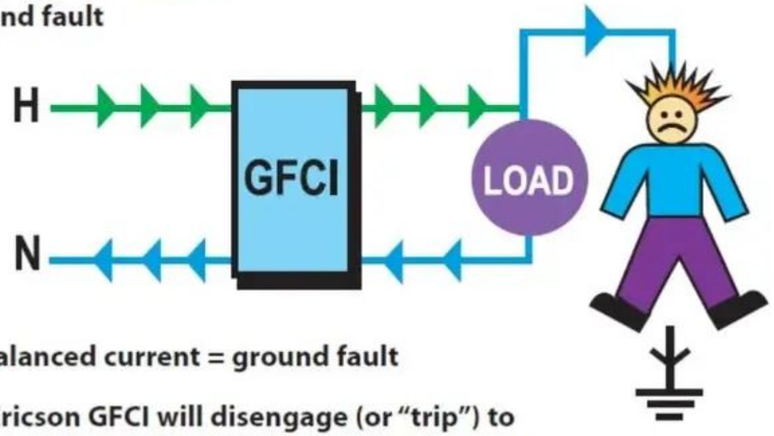
Ground fault circuit interruption (GFCI) plugs protect against faults

GFCI are designed to be one-way: load → circuit. But a solar panel may send power the opposite direction through the GFCI.

UL wants two-way GFCI certified and tested

* Could also be built in to inverter

Normal balanced current
No ground fault



Imbalanced current = ground fault

An Ericson GFCI will disengage (or "trip") to stop all current flow eliminating this hazard

c. Circuit overload: scenario

Home circuit may be 20 Amps

What if you plug in two hair dryers and draw 28 Amps?

Circuit breaker trips! Prevents overload.

What if a solar kit is plugged in upstream? Could mask the excess load on circuit (“breaker masking”)

Technical fixes, or careful siting on home circuits

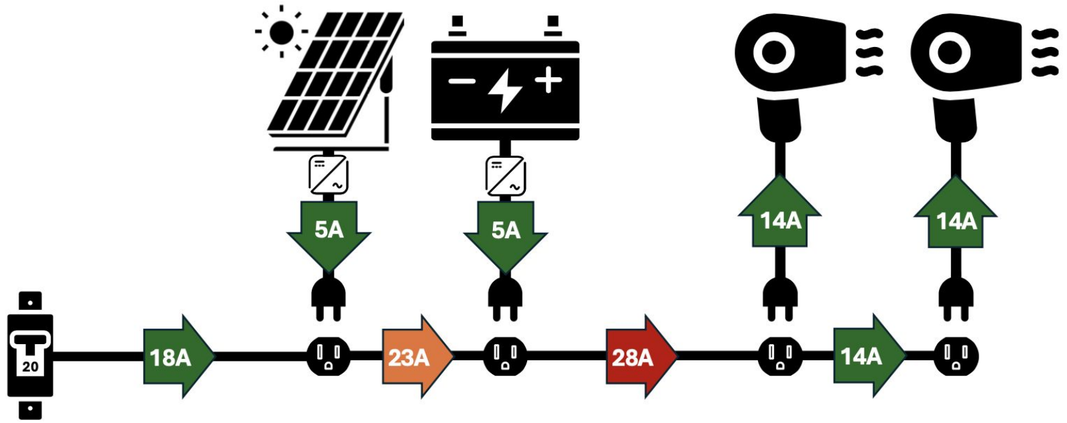


Figure 6. An illustration of the breaker masking problem. Here, the breaker does not trip despite there being 28 A on a section of the 20 A circuit.

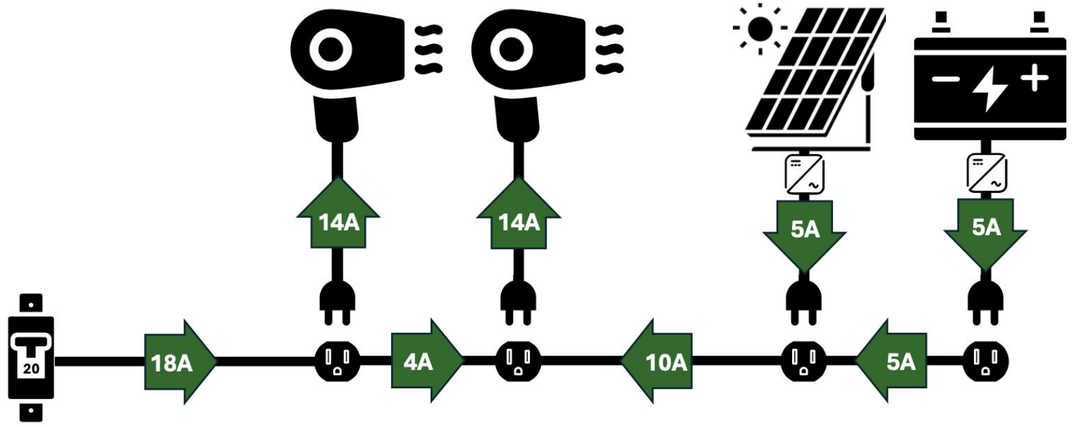


Figure 7. Plug-in DERs at the end of a branch could be acceptable, but this requires precise knowledge of the circuit.

Circuit overload: UL solution

UL wants a dedicated and unique receptacle and plug.

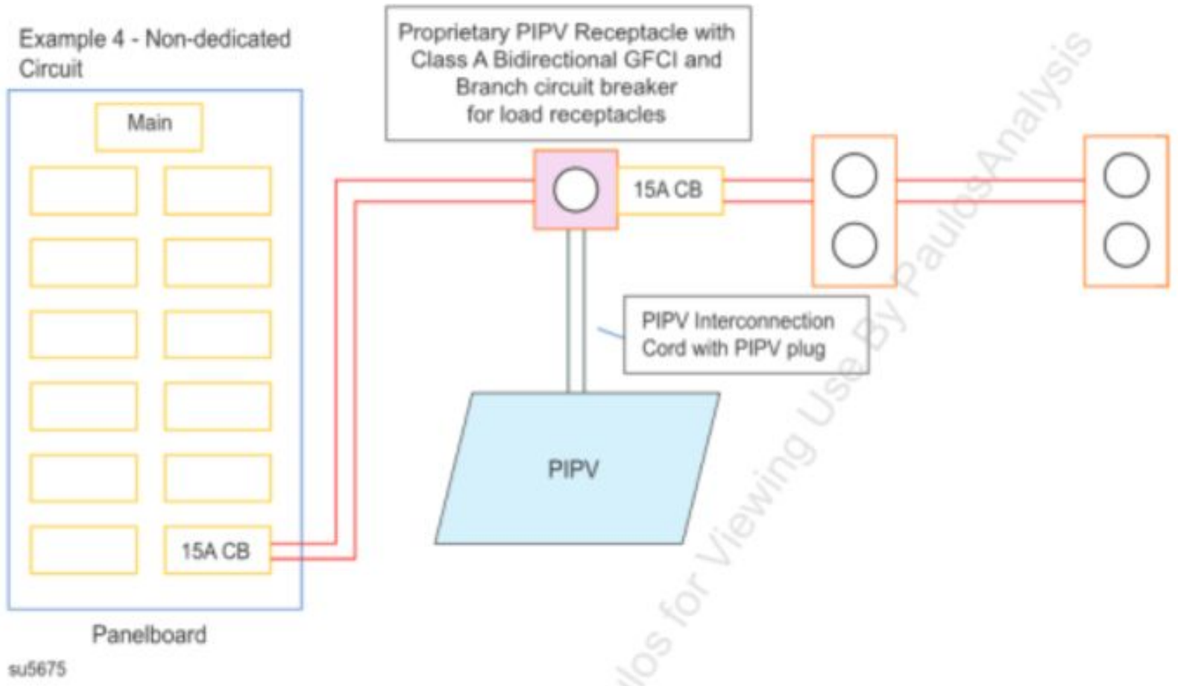
Receptacle would have bidirectional GFCI and in-line circuit breaker

Not currently made.

Likely requires an electrician.

Figure B.4

Non-dedicated Circuit Example 4 – 400 W PIPV backfed retrofit 12 AWG 20 A with bidirectional GFCI PIPV receptacle in place of first receptacle and a branch-circuit overcurrent protective device to prevent overcurrent on the branch circuit



NOTE: The bidirectional GFCI PIPV receptacle protects all downstream receptacles from ground-faults and overcurrent when it is in the first receptacle location.

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Circuit overload: other solutions

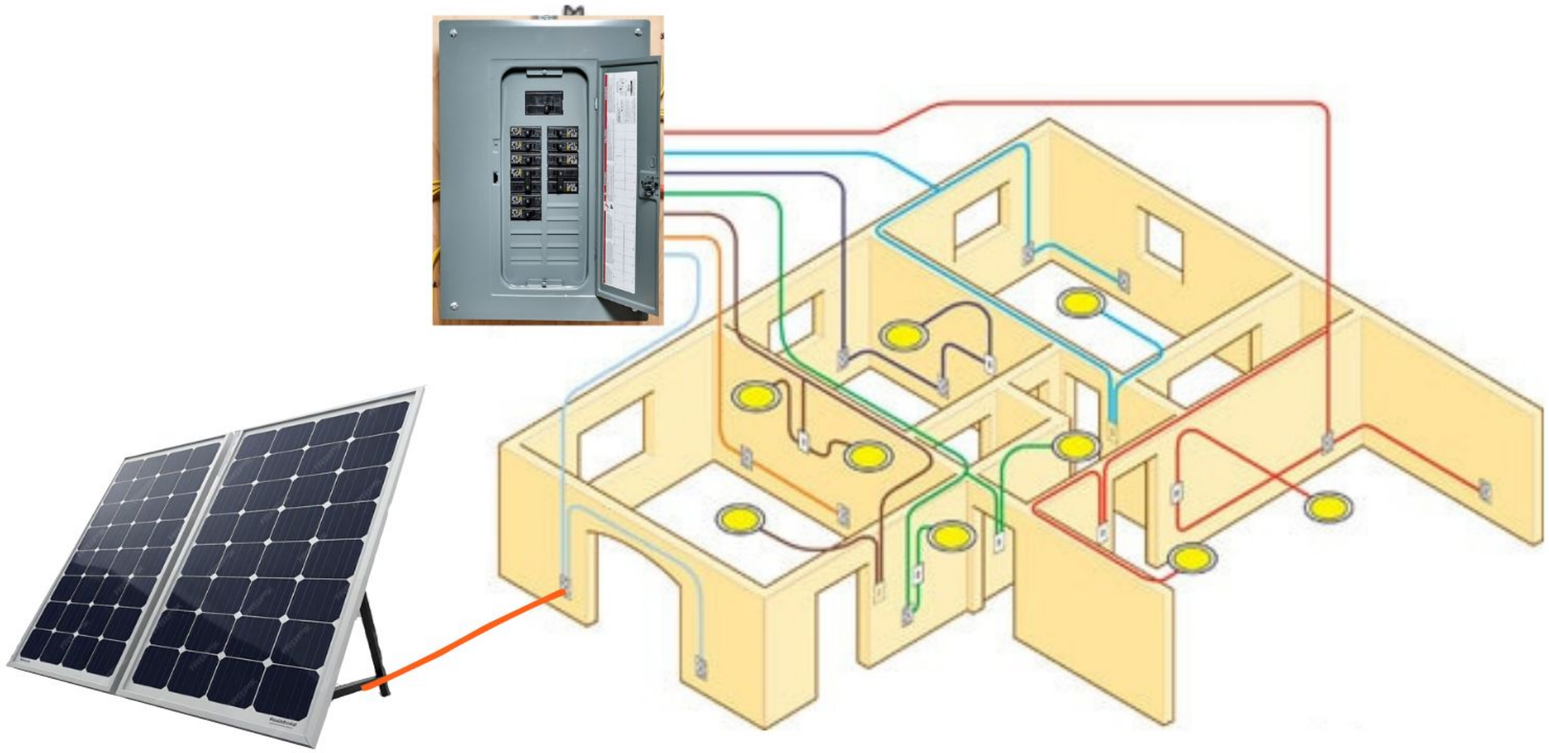
Location in home can prevent overloads

But homeowner may not know their circuits

Or use a dedicated circuit

Education or electrician needed

CA AB2612 would put dedicated circuit in building code



Regulatory Issues

Relationship with the grid

- Permission from utility to connect? Fees?
- Value of **exports**: sending power to the grid. Compensated or not?

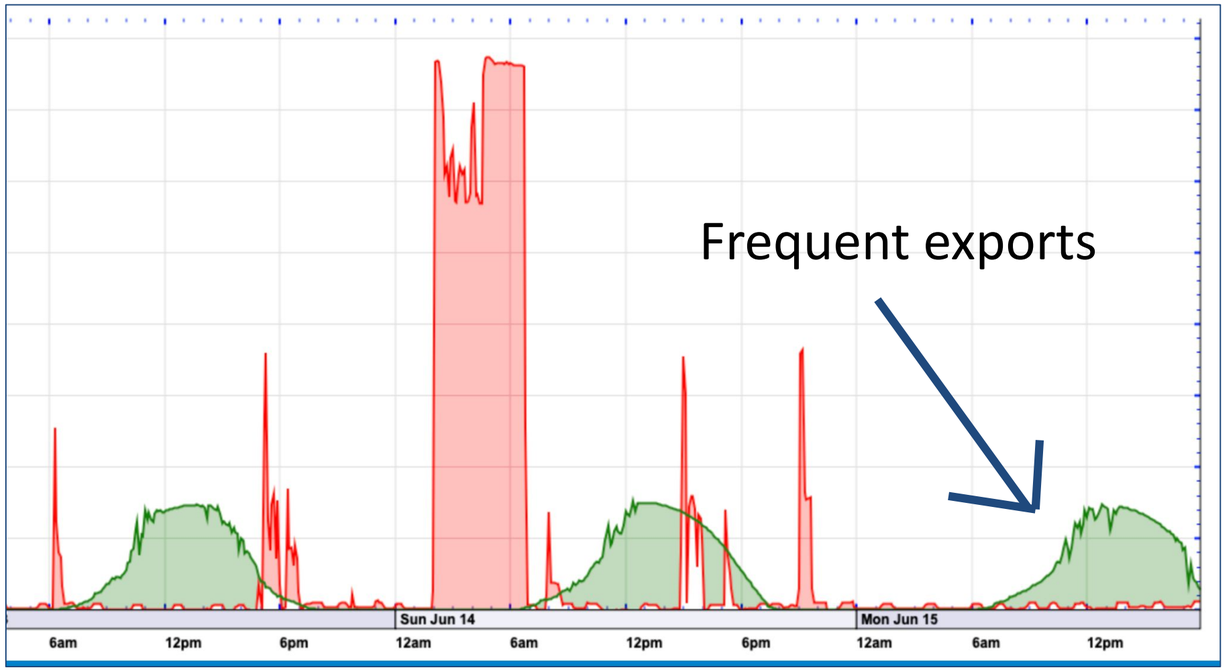
Local permitting

- As an appliance, not typically covered by building codes or National Electrical Code (NEC)
- But will local authorities want to regulate it anyway?

New & pending laws

Grid interconnection

- Size limits
- Exempt from utility agreement and fees
- Exempt from net metering
  - No permit, metering, and paperwork
  - But **no compensation for exports**



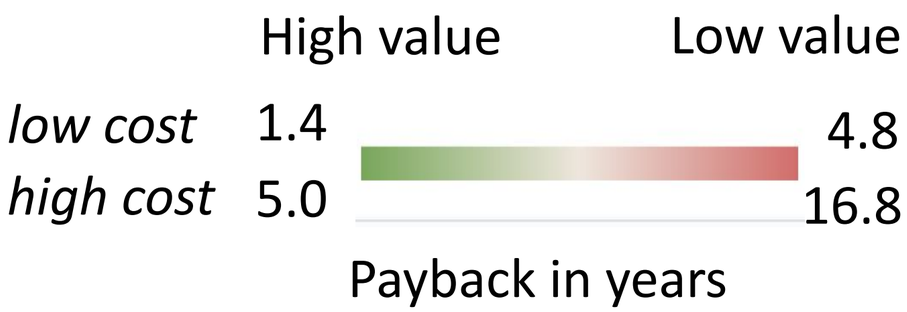
Local permitting

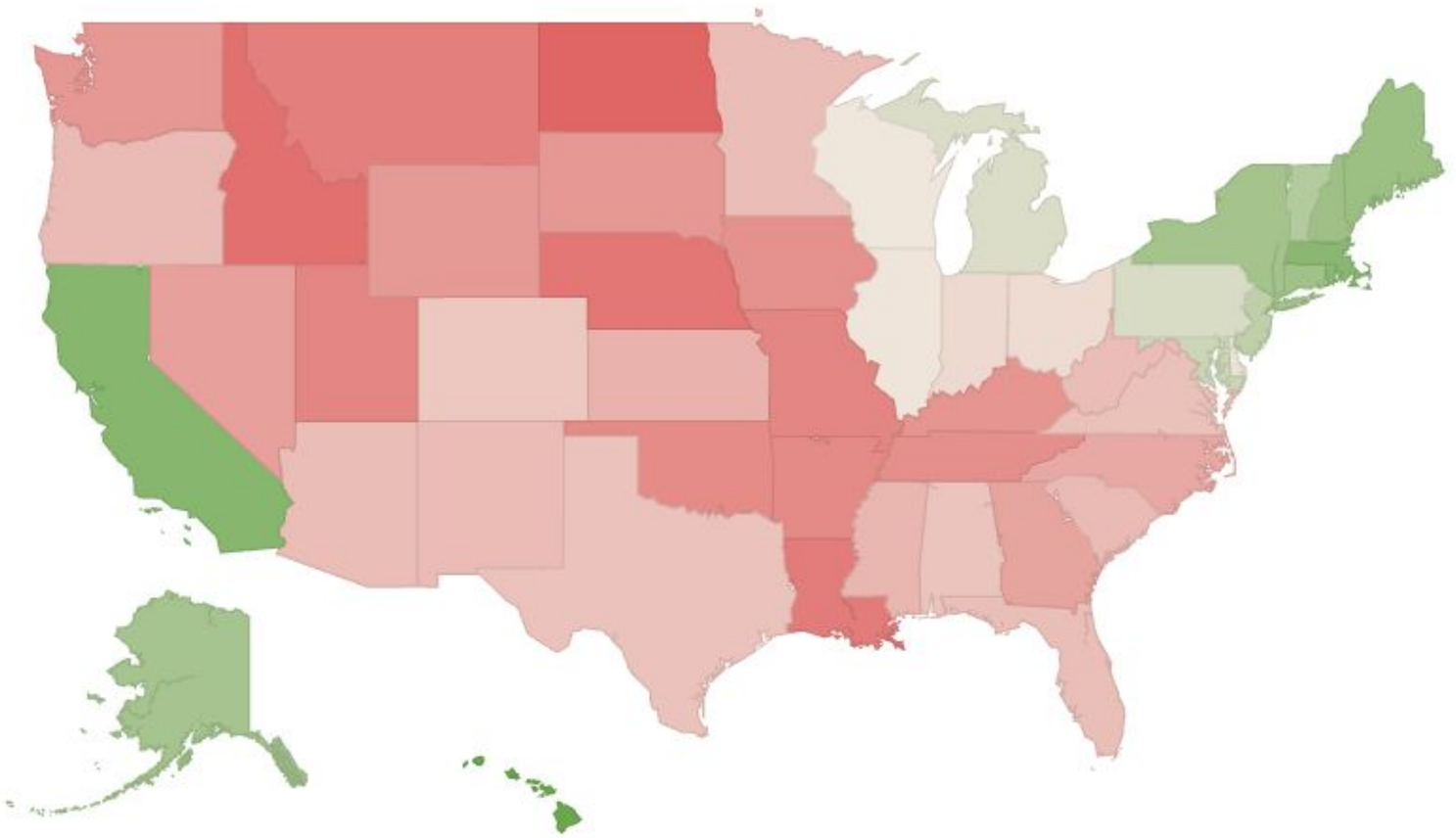
- No comment

Customer economics

Generation worth $100-500 per year

Value is a function of retail rates, installation cost, performance





tinyurl.com/pluginsolarcalculator

Economic aspects

Reduce solar costs

- Sales and marketing (customer acquisition)
- Local permitting and inspection
- Interconnection
- Labor

Compared to rooftop

- Smaller, suboptimal performance
- Risk: safety, consumer protection

Gateway or supplement?

Policy impact on economics

Key issue is treatment of exports

- Exemption from NEM means no value for exports
- Coverage by NEM or NBT requires utility involvement
- If no NEM, then full value captured only with self-consumption

If regulation requires electrician, permits, etc, the DIY value proposition erodes

Current market

120v AC inverters - not many (yet)

Logistics: Lack of local retailers but shipping rigid & large panels is expensive

- Option is foldable or flexible panels

Small batteries: backup power, portable for camping.

- They have built-in inverters, good for non-NEM customers
- Create off-grid options in your home

RV industry: active and transferable

Market evolution

A consumer product: manufacturers will create kits, retailers will emerge to manage sales and distribution

- Local solar installers, then retailers

Consumer education is critical: how to install systems safely

Market penetration

- Existing NEM customers (“expansion kit”)
- Then high users with large bills
- Then apartment dwellers

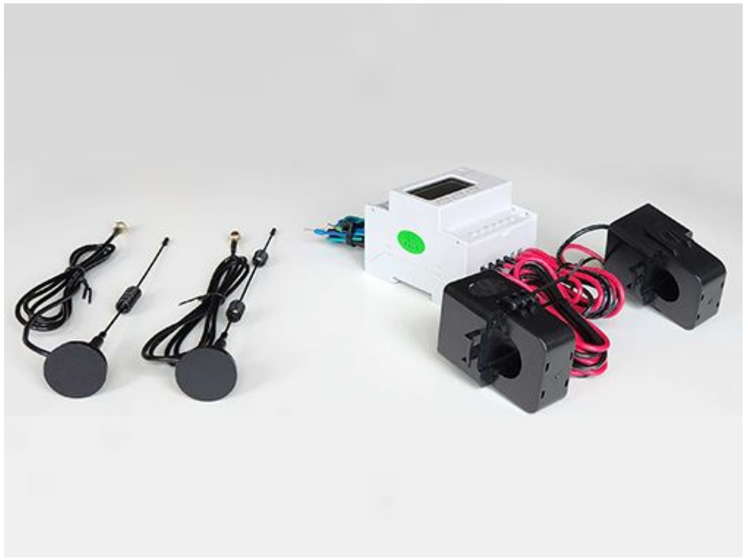
Hardware evolution

To address UL3700 compliance

Dedicated hardware
- Special receptacle
- Circuit monitoring and communications

Or new inverter capabilities

Export monitoring and prevention
- Results in either storage or curtailment
- Needs electrician?



My field research

First helped a friend install Brightsaver kit, $1.75/W

Then added to my existing 1.7 kW system

- Tried to replicate the German Ikea price
  - used panels, new 120V AC output inverter, DIY mount
- Got to 65¢/W (~$600)
- Plugged in to garage GFCI outlet

My lessons learned

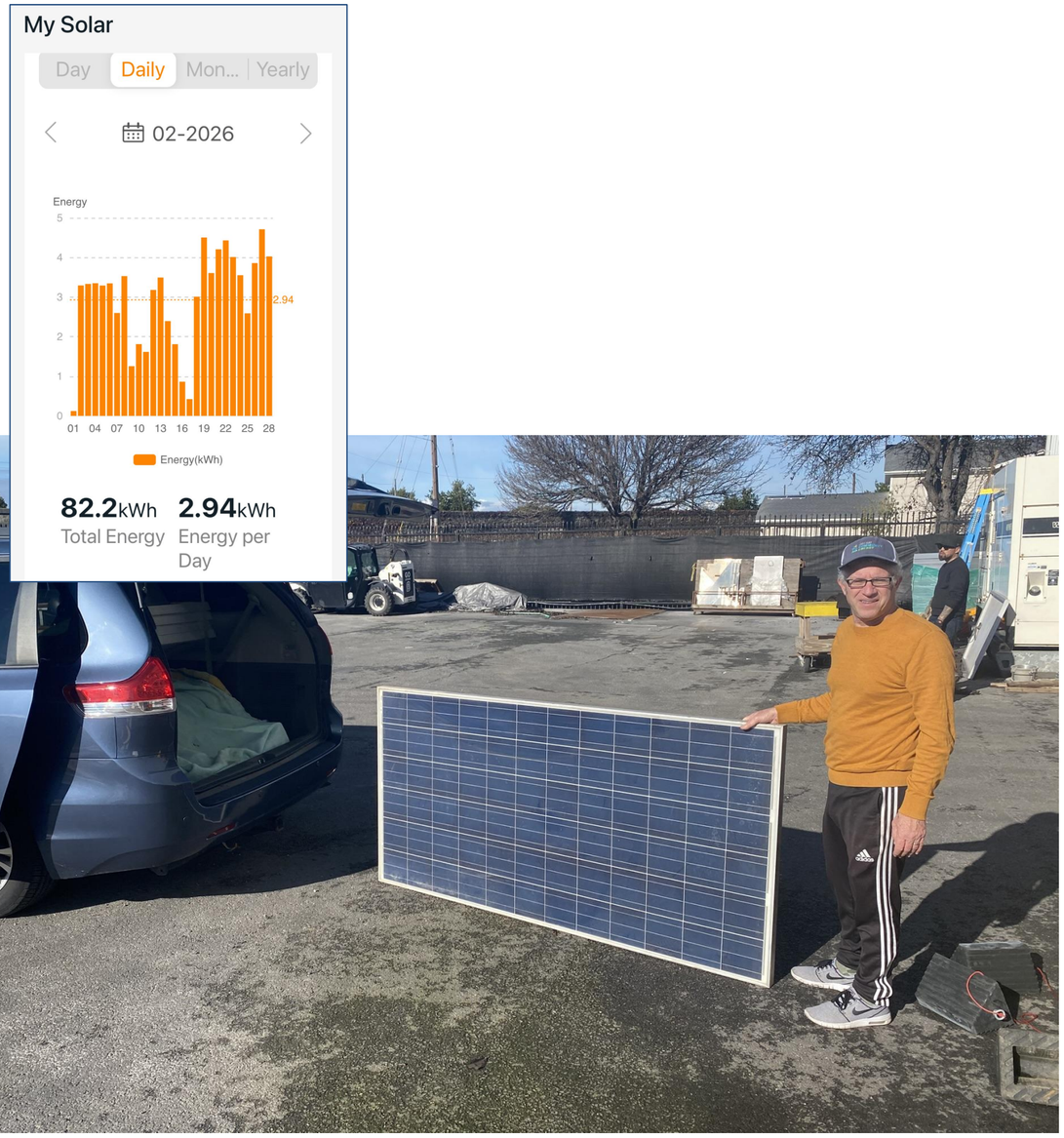
Producing 5-7 kWh per day, 715 kWh since January 23 (~$250 value).

A Saturday Dad project.

Some knowledge required.

Buying a kit eliminates the hardest part -- amps and volts!

Few inverters, limited retail.



Pathway to Realization

1 **Set Policies**
- Net metering & interconnection
- Integrate with energy assistance?

2 **Define Regulation**
- Safety certification and testing
- Exempt from permitting?

3 **Make markets**
- Consumer protection
- Consumer education

To-Do List for States

Electrical safety
- Influence and require UL standards
- Building codes

Education and training
- Develop materials or requirements for marketers
- Workshops and videos (YouTube University)

Consumer protection
- Register sellers?
- Disclosure

Policy
- Integrate with low-income energy programs
- Deal with HOA rules
- Subsidies?

Market making
- Promotional campaigns
- Group procurement
- Outreach to landlords, affordable housing

Opportunities for Energy Assistance

Expand LMI solar scope to renters, apartment dwellers, unhoused

- Incorporate into:
  - DAC-SASH and SOMAH
  - Low-Income Weatherization Program (LIWP) for SF/MF and Farmworker housing
  - Arrearage management, CARE/FERA
- May pass savings-investment ratio (SIR) test for federal WAP

Provide installation assistance and security

What States Need to Know About Plug-In Solar

January 2026

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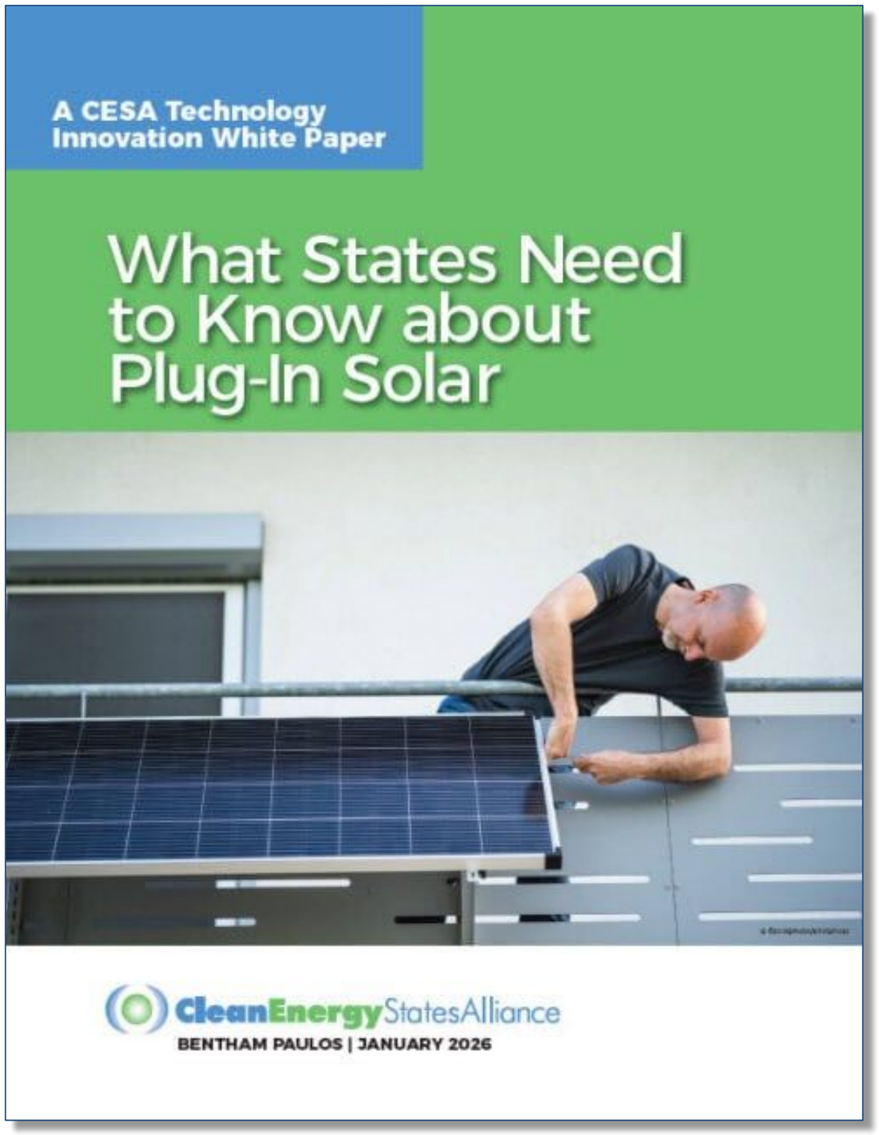

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Thank You

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