House Transportation Committee,
Co-Chair

House Military & Veterans' Affairs
Committee, Chair

House Education Committee,
Member

House Judiciary Committee,
Member

Alaska State Legislature

Representative Ted J. Eischeid

While in Session
State Capitol
120 4th St.
Juneau, AK 99801
(907) 465-2095

While in Anchorage
1500 W. Benson Blvd.
Anchorage, AK 99503
(907) 269-0240

Sponsor Statement
House Bill 257 – Plug in solar
34-LS1203\A

"An Act relating to the regulation of residential solar energy generation and portable solar energy generation devices."

Energy costs are a major burden for many Alaskan households. Alaska's per capita energy expenditure is the highest in the United States. This bill would clear the way for households and small businesses to utilize solar energy in a way never available before in Alaska. Given their recent introduction in some US markets including Utah, portable solar energy generation systems, not to exceed 1200-watt output, are an easy fit for Alaskan homes and businesses. These small portable solar systems are accessible, with a low entry price. Similar systems have been shown to pay for themselves within 5 years.

This bill is a practical, simple effort to remove or prohibit unnecessary regulatory barriers for small scale home and business use of solar energy in Alaska. The bill clarifies that small, portable solar energy generation systems should not be regulated in the same way larger grid connected home or utility scale projects are and eliminates permits, fees and administrative overhead without interfering with guidelines ensuring safety.

HB 257 provides a step forward in energy resilience. Alaska's overall electricity infrastructure is fragmented into more than 100 individual utilities, varying drastically in size, method of generation and age of grid. While offsetting cost for customers, these systems will help to improve reliability without requiring large scale investment into new infrastructure or subsidies.

This bill does not provide mandates nor establish incentives. The bill removes unnecessary administrative hurdles, encouraging development and innovation in industry which will further reduce the cost of entry for Alaskans. It is respectful of the autonomy of our diverse communities, assisting local authorities and utilities to work toward solutions that are tailored to their unique geographies, cultures and energy needs.

HOUSE BILL NO. 257

IN THE LEGISLATURE OF THE STATE OF ALASKA

THIRTY-FOURTH LEGISLATURE - SECOND SESSION

BY REPRESENTATIVE EISCHEID

Introduced: 1/20/26
Referred: House Special Committee on Energy, Community and Regional Affairs

A BILL

FOR AN ACT ENTITLED

"An Act relating to the regulation of residential solar energy generation and portable solar generation devices."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

*** Section 1.** AS 42.05 is amended by adding a new section to read:

Sec. 42.05.323. Portable solar generation devices. (a) A portable solar generation device is exempt from utility interconnection and net metering program requirements adopted by the commission if the device

(1) has a maximum power output of not more than 1,200 watts;

(2) meets the standards of the most recent version of the National Electrical Code; and

(3) is certified by Underwriters Laboratories or an equivalent nationally recognized testing laboratory.

(b) An electric utility may not require a customer using a portable solar generation device that meets the requirements of (a) of this section to

(1) obtain the electric utility's approval before installing or using the device;

(2) pay a fee or charge related to the device; or

(3) install additional controls or equipment beyond what is integrated into the device.

(c) An electric utility is not liable for any damage or injury caused by a portable solar generation device that meets the requirements in (a) of this section.

(d) In this section, "portable solar generation device" means a moveable photovoltaic generation device that is designed to be

(1) connected to a building's electrical system through a standard 120-volt alternating current outlet; and

(2) used primarily to offset part of an electric utility customer's electricity consumption.

HOUSE TRANSPORTATION COMMITTEE, CO-CHAIR

HOUSE MILITARY & VETERANS' AFFAIRS COMMITTEE, CHAIR

HOUSE EDUCATION COMMITTEE, MEMBER

HOUSE JUDICIARY COMMITTEE, MEMBER

ALASKA STATE LEGISLATURE

REPRESENTATIVE TED J. EISCHEID

WHILE IN SESSION
STATE CAPITOL
120 4th St.
JUNEAU, AK 99801
(907) 465-2095

WHILE IN ANCHORAGE
1500 W. Benson Blvd.
ANCHORAGE, AK 99503
(907) 269-0240

Sectional Analysis
House Bill 257: Plug In Solar
34-LS1203\A

"An Act relating to the regulation of residential solar energy generation and portable solar energy generation devices."

<u>Section 1</u>- Amends AS 42.05 to add a new section, 42.05.23.

Portable solar generation devices.

Portable solar devices with an output of not more than 1200 watts, certified by a nationally recognized testing laboratory and meeting the standards of the National Electric Code, are exempt from utility interconnection. Electric utilities may not require customers using these devices to obtain permission, pay fees or install additional controls or equipment. Electric utilities are not liable for any damage or injury caused by the use of these devices. Portable solar generation devices are defined as a moveable photovoltaic device designed to be connected to a building's electrical system through a standard 120-volt outlet and used primarily to offset part of a customer's electricity consumption.

Fiscal Note

State of Alaska
2026 Legislative Session

Bill Version: HB 257
Fiscal Note Number:
() Publish Date:

Identifier: HB257-DCCED-RCA-02-06-26
Title: PORTABLE SOLAR ENERGY GENERATION DEVICES
Sponsor: EISCHEID
Requester: (H) ENERGY

Department: Department of Commerce, Community and Economic Development
Appropriation: Regulatory Commission of Alaska
Allocation: Regulatory Commission of Alaska
OMB Component Number: 2417

Expenditures/Revenues

Note: Amounts do not include inflation unless otherwise noted below. (Thousands of Dollars)

	FY2027 Appropriation Requested	Included in Governor's FY2027 Request	Out-Year Cost Estimates				
OPERATING EXPENDITURES	**FY 2027**	**FY 2027**	**FY 2028**	**FY 2029**	**FY 2030**	**FY 2031**	**FY 2032**
Personal Services							
Travel							
Services							
Commodities							
Capital Outlay							
Grants & Benefits							
Miscellaneous							
Total Operating	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Fund Source (Operating Only)

None							
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Positions

Full-time							
Part-time							
Temporary							

Change in Revenues

None							
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Estimated SUPPLEMENTAL (FY2026) cost: 0.0 *(separate supplemental appropriation required)*

Estimated CAPITAL (FY2027) cost: 0.0 *(separate capital appropriation required)*

Does the bill create or modify a new fund or account? No

(Supplemental/Capital/New Fund - discuss reasons and fund source(s) in analysis section)

ASSOCIATED REGULATIONS

Does the bill direct, or will the bill result in, regulation changes adopted by your agency? Yes

If yes, by what date are the regulations to be adopted, amended or repealed? 07/01/28

Why this fiscal note differs from previous version/comments:

Not applicable, initial version.

Prepared By: John M. Espindola, RCA Chair Phone: (907)276-6222
Division: Regulatory Commission of Alaska Date: 02/06/2026
Approved By: Hannah Lager, Administrative Services Director Date: 02/06/26
Agency: Department of Commerce, Community, and Economic Development

STATE OF ALASKA **BILL NO.** HB 257
2026 LEGISLATIVE SESSION

Analysis

House Bill 257 adds a new section to the *Alaska Public Utilities Regulatory Act*, AS 42.05, as it applies to net metering and utility interconnection to exempt portable solar generation devices from utility interconnection and net metering program requirements adopted by the Regulatory Commission of Alaska (RCA) if the devices meet specific standards. Currently, all electric utilities are required by 3 AAC 50.900 to have net metering programs unless they produce all power except standby or emergency power from a renewable source listed in 3 AAC 50.920(1)(A) - (H); have total retail sales less than 5 Gigawatt-Hours a year; or are otherwise exempted by the RCA to address system stability constraints or other operational issues.

Devices exempted from utility interconnection and net metering program requirements under House Bill 257 must use portable photovoltaic generation to produce less than 1.2 Kilowatts in output; meet the standards of the most recent version of the National Electrical Code; be certified by Underwriters Laboratories or an equivalent nationally recognized testing laboratory; connect to a building's electrical system through a standard 120 Volt alternating current; and be used primarily to offset part of the electric utility customer's consumption. House Bill 257 provides that electric utilities may not require customers obtain the utility's permission before installing or using the device, pay a fee or charge related to the device, or install additional controls or equipment beyond what is integrated into the device. Finally, House Bill 257 exempts utilities from liability for any damage or injury caused by a portable solar generation device that meets the requirements of the section.

Passage of House Bill 257 may require the RCA to open a rulemaking proceeding to modify 3 AAC 50.910 - .949 to reflect the statutory exemption. Electric utilities would need to make tariff filings to ensure their tariffs conform to the new statutory language.

RCA regulations dockets must be completed within 730 days of the issuance of an order commencing the regulations docket (AS 42.05.175(e) requires the RCA to complete regulations dockets within 730 days from the initiating order). This legislation does not propose an effective date. Should House Bill 257 be passed this legislative session, the RCA would commence a regulations docket shortly thereafter (the estimated completion date for *Associated Regulations* is based on a July 1, 2026, date for an initiating order).

The RCA expects to implement the provisions of this legislation with existing resources.

HB 257

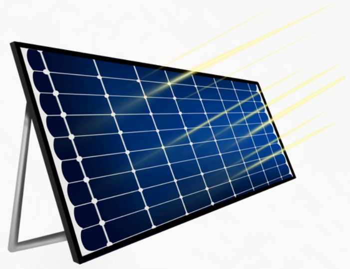
PLUG IN SOLAR ENERGY GENERATION

Representative Ted Eischeid
House District 22

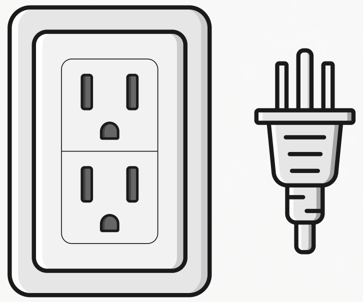
Alaska's Energy Costs

1. Alaskans spend more per capita on energy than Americans in any other state
2. The high cost of energy, combined with high demand for heating, cooling and light creates a burden for Alaskan households and businesses

Plug in Solar Offers Some Relief



Small, portable solar generators can alleviate some of this cost



These generators plug directly into a standard outlet, requiring minimal installation

Accessibility is high with low cost of entry and relatively quick ROI

Potential Issues

- Safety - Units must not be energized while grid is shut down or while unplugged
- Small grid - Too many units in a small utility could reduce draw and endanger the grid

Solutions

- Safety - Part of the certification process that makes these units compliant with this bill includes a shut off switch. No current sensed, no power produced

- Small grid - Communities and Utilities should communicate regarding any widespread rollout of new technology

In Summary

- Alaskan energy is an expensive burden to Alaskan households and businesses.

- HB 257 opens a pathway to alleviating some of that burden while maintaining safety and without creating mandates or costly incentive programs.

Questions?

Democratizing Solar

How Plug-In Solar Expands Energy Affordability and Resilience for 60 Million Americans

BRIGHT SAVER

Democratizing Solar

How Plug-In Solar Expands Energy Affordability and Resilience for 60 Million Americans

AUTHORS **Cora Stryker[1], Sam Miller Khaikin[1], Kevin Chou[1], Rupert Mayer[1], Daniel L. Gerber[2]**

CONTRIBUTORS **Sachu Constantine[3], Philip A. Wight[4], Chirag Lala[5], Yakov Feygin[5,6], Josh T. Smith[7], Nathan Phelps[3]**

AFFILIATIONS 1. **Bright Saver**; 2. **Lawrence Berkeley National Laboratory**; 3. **Vote Solar**; 4. **University of Alaska, Fairbanks**; 5. **Center for Public Enterprise**; 6. **Berggruen Institute**; 7. **The Abundance Institute**

Contents

Abstract

Electricity prices continue to rise, yet ~70% of households in the U.S. cannot access rooftop solar due to upfront costs, roof constraints, and or rental status. Plug-in solar — small, self-installed systems that connect to a standard outlet — offers a market-driven alternative requiring no subsidies, tax credits, or public funds. Already adopted by as many as 4 million households across Europe and Utah, these systems are 80-97% cheaper than average U.S. rooftop systems and can pair with batteries for outage resilience.

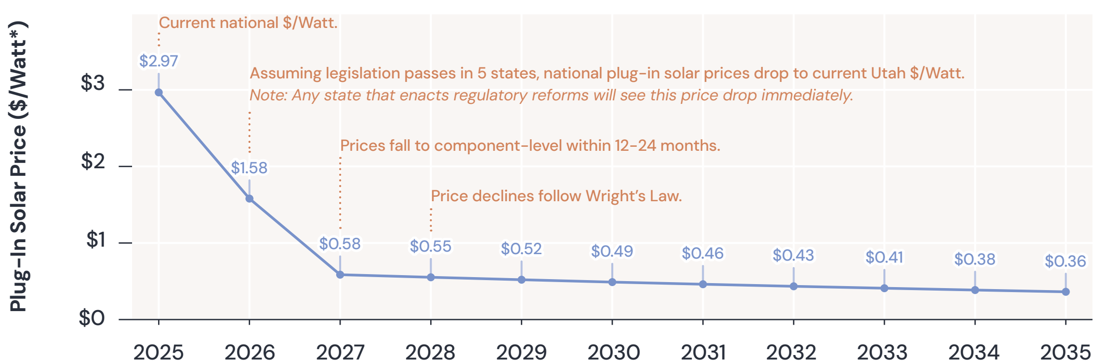
In 2025, Utah enacted H.B. 340, a bipartisan, budget-neutral regulatory reform that exempts ≤1,200-watt systems from one-size-fits-all interconnection rules designed for much larger arrays. If five or more states adopt similar reforms, market forces, competition and learning curve effects are expected to cut costs further. The result: more affordable energy bills, broad access to clean energy, billions of dollars saved in household energy costs, and removal of outdated regulations which restrict adoption.

In sum, with targeted regulatory reforms in 5+ states, we project:

- Market forces will drive widespread adoption without subsidies, tax credits, or incentives.
- The cost of plug-in solar arrays will fall to ~$0.50/watt within 2 years.
- Average payback periods will fall to ~4 years by 2028 and ~3 years by 2032.
- Approximately 24M households — 60M people, or one in six Americans — will use a plug-in solar system by 2035.

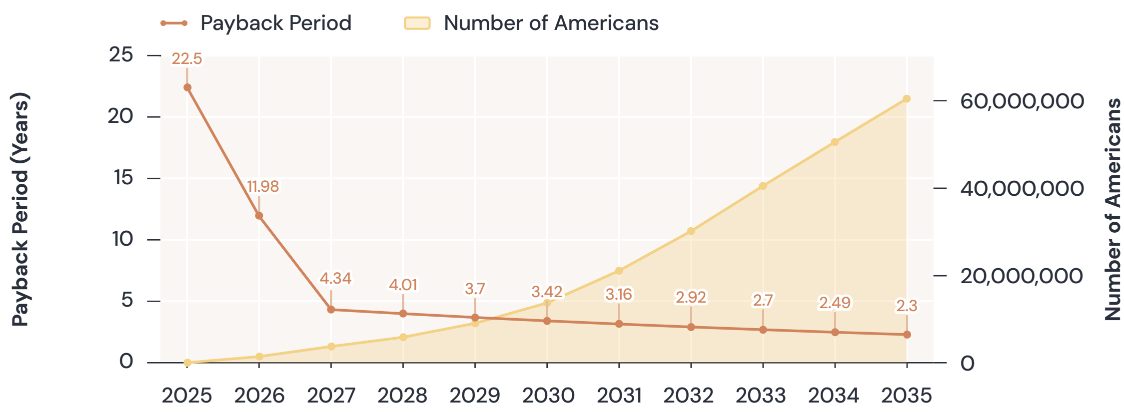
Figure 1 and Figure 2 summarize our key findings.

FIGURE 1.
PROJECTED PLUG-IN SOLAR PRICES, 2025-2035



SOURCE: BRIGHT SAVER

FIGURE 2.
PROJECTED PLUG-IN SOLAR PAYBACK PERIOD & NATIONAL ADOPTION, 2025-2035



SOURCE: BRIGHT SAVER

Executive Summary

The solar revolution is leaving behind millions of people living in the U.S. — precisely the people who most need relief from rising energy bills. The energy affordability crisis is only compounded by a shifting policy landscape, underscoring the urgency of pursuing forms of domestic energy generation that do not rely on public funding to deliver savings and resiliency.

Plug-in solar (also called "portable solar" or "balcony solar" in Europe) offers a low-cost scalable solution. Like rooftop solar, plug-in solar supplies power to traditional grid-connected homes but their small size, affordability, and ability to be self-installed make them accessible to a new subset of the U.S. population. Key benefits include:

- **Affordability:** Plug-in systems are currently **80-97% cheaper than rooftop arrays** ($600-$5,000, depending on size and battery storage capacity), roughly half the cost on a per-watt basis in states with modern regulations, and roughly equivalent per watt in states without modern regulations. Within 12-24 months of regulatory reform in 5+ states, we project that prices will drop further — to roughly one quarter of today's costs per watt.
- **Accessibility:** Renters, apartment dwellers, and homeowners with unsuitable roofs who have been shut out of the residential solar market can produce their own clean energy.
- **Regulatory Reform:** By cutting unnecessary red tape and exempting small systems from rules designed for much larger arrays, states unlock immediate consumer savings and open the market to competition and innovation.
- **Public Health:** Widespread adoption could displace millions of metric tons of emissions annually, improving air quality for millions of people.

In 2025, Utah passed H.B. 340 — a bipartisan budget-neutral regulatory reform that modernized outdated requirements for ≤1,200-watt systems. Just months after passage, full system costs have already fallen by roughly 50%.

If additional states adopt similar reforms:

- System costs will fall immediately by roughly 50% in every state that enacts similar reform.
- Within 12-24 months of regulatory reform in 5+ states, plug-in system prices will drop further — to less than one quarter of today's cost per watt for both rooftop solar and today's plug-in solar in states without modern regulations.

BARRIERS AND A PATH FORWARD

Current regulations increase the costs to consumers and reduce the benefits for the majority of the American public. In 49 states, current guidelines require one-size-fits-all interconnection agreements for any solar system that connects to the grid. This is regulation designed for rooftop systems 5-20 times larger with entirely different safety considerations. These impractical regulations make mass adoption of plug-in solar nearly impossible.

To address this barrier, Utah passed H.B. 340 in March 2025, offering a bipartisan, unanimous, budget-neutral legislative model. The law:

- Defines small solar systems (≤1,200 W) as a new de minimis generation class;
- Exempts these small systems from standard utility interconnection and net metering agreements, processes designed to evaluate larger systems; and
- Allows small amounts of backfeeding to the grid without charges to the utility or the consumer.

CASE STUDIES AND NATIONAL IMPACT

A 2025 pilot by the nonprofit Bright Saver in California demonstrated strong consumer demand, especially among renters, seniors, and low-to-moderate income households.

If H.B. 340-style legislation were adopted in other states:

- Tens of millions of currently excluded households could produce solar energy.
- Public costs would remain zero, as market-rate systems would be affordable and cost-effective for consumers even without public incentives or subsidies.
- Manufacturers would enter the U.S. market and competition would drive down costs dramatically.

To unlock clean energy access for all people living in the U.S., states should follow Utah's lead and enact legislation similar to H.B. 340. Such budget-neutral regulatory reform would lower household energy costs, expand access to affordable energy, and strengthen household resilience and energy independence.

I Introduction
The Energy Cost Crisis and the Limits of Rooftop Solar

U.S. households are experiencing rising energy costs and energy insecurity in the face of an increasingly unreliable grid. Residential electricity rates rose 27% nationwide between 2019 and 2024[1] and are projected to rise another 18% by 2026.[2] For low- and moderate-income families, the impact is severe: nearly one-third of households responding to a SECC Survey reported difficulty paying their electricity bills in 2024 — a 24% increase from the prior year.[3] Among renters and those earning under $50,000 annually, the hardship is even more pronounced.

Rooftop solar has emerged as a potential tool to reduce energy costs and bolster energy resilience. Declining hardware prices have driven residential solar adoption to grow rapidly — accounting for a significant share of new U.S. generating capacity.[4, 5] Yet, this growth obscures a major problem: approximately 70% of Americans are effectively shut out of the rooftop solar market, particularly low-to-moderate income households.[6, 7] Excluded groups include:

- Renters with no ownership over their roofs.
- Homeowners with roofs that are shaded, structurally unsound, or poorly oriented.
- Households that cannot afford high upfront costs and/or lack access to financing.

II Defining the Problem
Widespread Demand, Limited Access

A 2024 Pew survey[8] found that millions of U.S. households either actively want or would consider getting solar. Moreover, approximately 73% of the U.S. population is concerned about rising energy costs[9] and two-thirds of Americans are concerned about climate change[10] — two key drivers of solar demand.

However, national installation rates remain low: as of Q3 2025, only about 5% of U.S. households, or 7% of single-family detached homes, have rooftop systems[11] even in sunny states with strong policy environments, installation rates lag far behind reported demand. In California, for example — by far the largest U.S. market for rooftop solar — still less than 25% of all single-family detached homes have solar installed.[12]

A deeper look at structural and financial barriers underscores the scope of the exclusion:

- **Dwelling Constraints:** An estimated 35-37% of Americans rent their homes or live in multifamily dwellings of three stories or more.[13, 14] Of the remaining owner-occupied homes, a significant share are disqualified from solar due to roof condition, shading, or age.[15, 16] Factoring in these constraints, only about 38% of households may be eligible, in practice, for rooftop solar.
- **Financial Exclusion:** An average-sized rooftop solar system costs $25,000-$40,000 without incentives depending on location and battery storage capacity.[17] With financing, interest, and insurance, real costs often exceed what most families can afford. Further, roughly one in five homeowners have credit scores below 650,[18] limiting their ability to qualify for loans with favorable conditions, shrinking the percentage of Americans who have access to rooftop solar to 30% or less.[19]

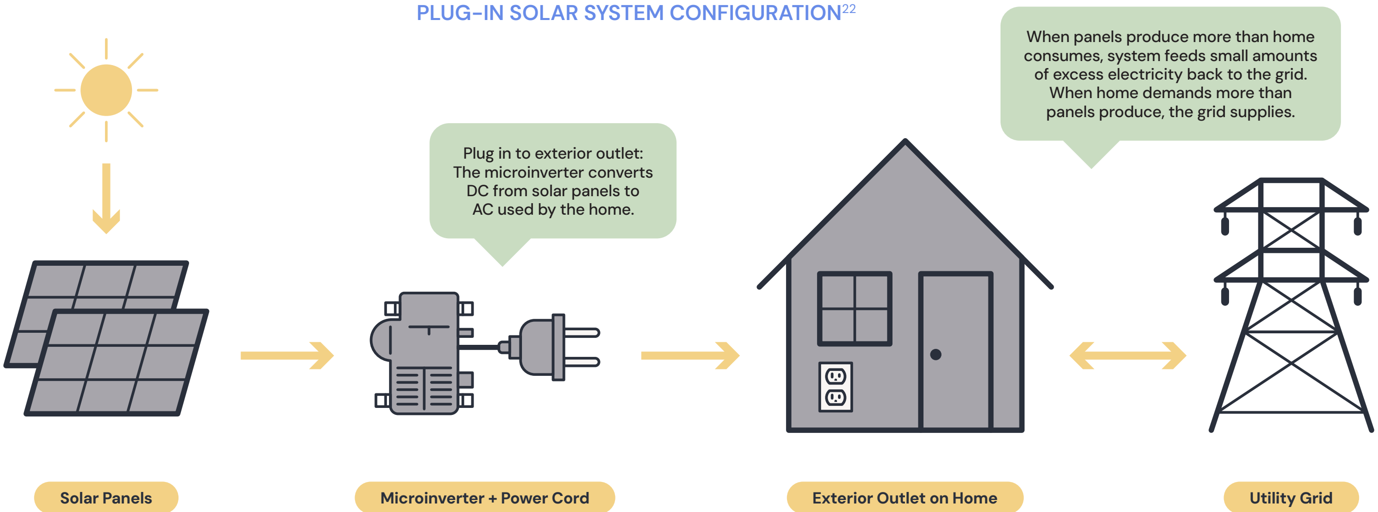
Taken together, these barriers place distributed clean energy firmly out of reach for tens of millions of Americans.

CASE STUDY: GERMANY

Plug-in solar has been widely adopted in Europe for over ten years, mostly by renters in urban areas who have no ownership over their roofs. In Germany, where up to 4 million households have adopted the technology,[20, 21] these systems can be installed by the homeowner or tenant in minutes.

Figure 3 illustrates how plug-in solar systems are configured in Europe.

FIGURE 3.
PLUG-IN SOLAR SYSTEM CONFIGURATION[22]



Faced with fuel supply limitations and rising energy costs related to the war in Ukraine, Germany passed legislation to update plug-in solar regulatory frameworks. The policy was widely successful: an estimated 4 million German households now use plug-in "balcony" solar systems, totaling several gigawatts of clean energy capacity from balcony solar systems country-wide.[23] In 2024 alone, German plug-in solar adoption grew by approximately 73.3%,[24] illustrating the continued appeal of such systems even as fuel costs stabilize.[25] In fact, 25% of Germans reportedly plan to install one or two plug-in solar modules at their residence or have done so already.[26]

POLICY REFORMS DRIVING GROWTH IN PLUG-IN SOLAR SYSTEMS

Recent regulatory changes have significantly accelerated the adoption and capacity expansion of plug-in solar systems in Germany. Prior to 2024, these systems were restricted to a maximum inverter output of 600 watts. However, the 2024 Solar Package I policy raised this threshold to 800 watts due to the strong safety record of the 600-watt threshold.

Solar Package I also removed several barriers to access and streamlined the process for users. Individuals are now allowed to install plug-in solar units independently, without needing oversight from a certified technician or utility provider. Landlords are no longer permitted to deny installation requests from tenants unless specific, justified conditions — such as heritage preservation — apply. The registration process in Germany, through the MaStR (Market Master Data Register) has been simplified to a brief online form, making participation easier and more inclusive. Consumers can now purchase plug-in solar kits directly from local hardware or retail stores and complete the installation and registration within the same day.

This success was made possible by simple, clear regulatory carve-outs and safety standards, demonstrating that targeted policy reform can unlock mass adoption. Simple legislative reforms eliminated the need for utility interconnection agreements for small systems (allowing up to 800 W of backfeeding to the grid). Manufacturers soon followed, creating small, easy-to-install systems that are now widely available at a variety of retailers at low price points. In fact, the payback period for some balcony solar systems in Germany is now less than 3 years[27] — a threshold the U.S. is expected to cross within ten years of targeted regulatory reforms.

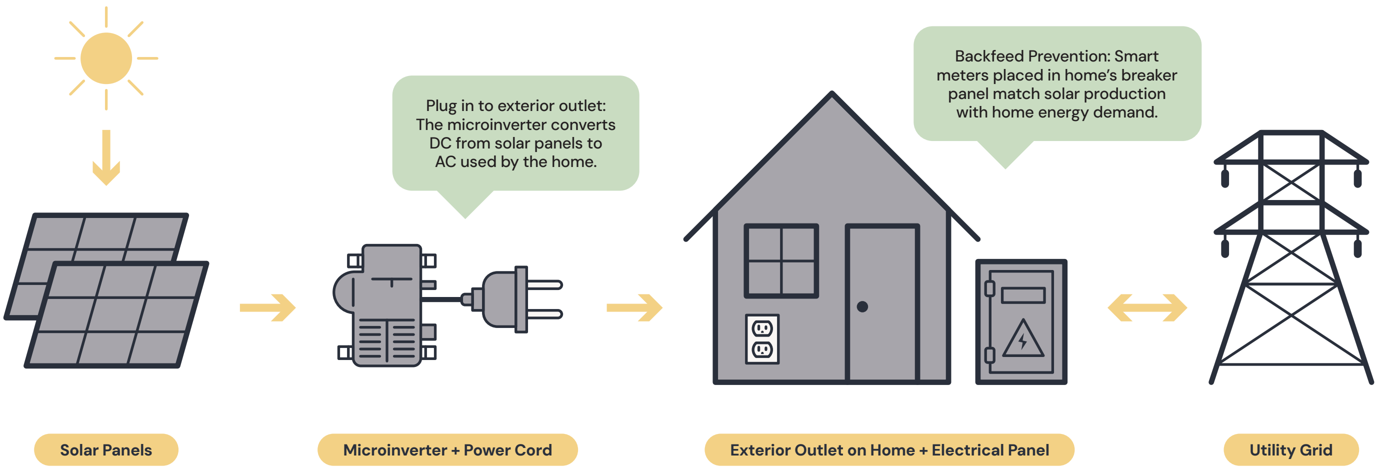
IV The U.S. Policy Landscape
Outdated Rules, Emerging Models

In the United States, outdated regulatory frameworks prevent plug-in solar from scaling. One-size-fits-all utility interconnection requirements, designed for large rooftop arrays 5-20 times as large, currently apply to all grid-tied solar — even small plug-in systems with very different safety parameters. These requirements nearly double the cost of systems to American households, slow adoption, and deter manufacturers for two reasons:

1. The only plug-in solar systems that are widely available in the U.S. today include expensive backfeed prevention hardware that stops excess electricity from flowing back to the grid. These systems do not conform to interconnection guidelines in many states, which stipulate that interconnection agreements are expected even for systems that do not feed energy back to the grid. Backfeed prevention is therefore more of an "under the radar" workaround that is difficult to detect for utility companies than a solution to the regulatory problem.
2. The additional hardware's complexity requires installation by an electrician, driving up costs to consumers and making self-installation by millions nearly impossible.

Figure 4 shows the typical configuration of plug-in solar systems with backfeed prevention.

FIGURE 4.
PLUG-IN SOLAR SYSTEM CONFIGURATION WITH BACKFEED PREVENTION



The exception is Utah. In 2025, the state passed H.B. 340 unanimously, a bipartisan bill that exempts solar systems (i.e., "photovoltaic systems") under 1,200 watts from one-size-fits-all interconnection guidelines. The legislation:

- Creates a new class of small photovoltaic systems under 1,200 watts.
- Requires safety standards to protect utility workers and consumers alike.
- Allows plug-in solar to be installed by residents.
- Exempts these small systems from interconnection agreements with utilities, lowering the cost to consumers and eliminating permitting wait times and net metering.
- Enables backfeeding excess energy up to the 1,200-watt threshold to the grid, delivering energy to the utilities at no extra cost to them.
- Protects the utilities from liability of damage or injury from the devices.

Crucially, the bill passed without fiscal impact. Utah's leadership has created a first-of-its-kind market signal to manufacturers and functionally eliminated soft costs, such as the costs of installation, permitting, utility interconnection and installer overhead.

Just months after passage, one manufacturer has already entered the Utah market, with more expected in the near-term. Competition among manufacturers is expected to drive down prices, already a fraction of rooftop systems and about half the cost of plug-in systems in the other 49 states, setting the stage for widespread adoption as in Germany.

WHY IS REFORM IN FIVE STATES THE CRITICAL THRESHOLD?

Based on the authors' direct communications with manufacturers and investors, industry leaders are eager to enter the U.S. plug-in solar market. At present, however, they view only one state — Utah — as free of regulatory barriers. These are the very parties who will determine market growth, and they have signaled a clear threshold: once at least five states reform outdated regulations, they will see a sufficiently large market to justify full-scale entry into the U.S.

According to Kerim Baran, Founder of Enki Solar Investments, "Once 5 or so more states modernize their rules, it unlocks the massive $250 billion residential U.S. electricity market. That's when plug-in solar shifts from a policy niche to a mainstream investable trend."[28]

Similarly, according to Meghan Wood, CEO of Raya Power, "in Germany, collective action across regions proved that clear, modern rules can rapidly unlock mass adoption of plug-in solar. If five or more U.S. states follow this path, it could spark a similar movement — one that would give startups like ours, and the investors backing us, the conviction to provide and scale plug-in solar products aimed for those unserved by solar solutions today, such as apartment dwellers."[29]

In addition, former CEO of Jackery, Anson Liang shared in a personal email, "Utah has been an odd singular state in the U.S. If just a few more states also align on clear regulations, we can justify making the bigger R&D and marketing investments — on top of our rapidly growing European business — to go after this market at scale."[30]

In short, the manufacturers and investors who would otherwise transform the plug-in balcony solar movement into a low-cost high-savings market capable of exponential growth as in Germany are poised to enter the market as soon as regulatory gray areas are removed in enough states to justify their investment.

V Evidence and Human Impact
The California Case Study

Since January 2025, the nonprofit Bright Saver has been piloting a subsidized plug-in solar program in California using an 800-watt system that prevents any excess electricity from being fed back into the grid.

Despite logistical challenges, Bright Saver has been able to serve people who have long wanted solar power but faced significant barriers — such as being renters, owning homes with unsuitable roofs, or lacking the financial means to invest in a $25,000-40,000 system.

One example is Terry, a retired man in his seventies living on a fixed income in Oakland, California. In March 2025, Bright Saver volunteers installed an 800-watt plug-in solar system with backfeed prevention hardware on his deck. Reflecting on the installation, Terry shared,

> "I've wanted solar for a long time, but I need a new roof and I'm in my seventies — will I live long enough for the investment to pay off?"

Since then, his system has been producing and consuming an average of 2 kWh per day, according to readings from his device. At his current average electricity rate, this is saving him approximately $27 per month. At 2025 market rates, assuming no subsidies or tax credits, his system — including mounting and installation — costs $2,364, resulting in a 7.3-year payback period,[31] roughly on par with estimated payback periods for rooftop solar in California. Given that, according to the California Public Utilities Commission, residential electricity rates have increased by 104% over the ten-year period from January 2015 to April 2025 in Terry's area and are projected to rise significantly over the next decade,[32] his system is likely to pay for itself in electricity bill savings significantly faster than the 7.3 year payback period projected at current electricity prices.

However, if 5+ states including California adopted legislation similar to Utah's H.B. 340, Terry's system would have cost $622.91 once markets matured, reducing his payback period to 1.92 years at current electricity prices without subsidies or tax credits.

Table 1 summarizes Terry's cost and payback scenarios under each model at current electricity prices. All system costs are for systems without batteries, assume no tax credits or subsidies, and account for tariffs as of September 2025.

TABLE 1.
PLUG-IN SOLAR COST AND PAYBACK SCENARIOS

Scenario	System Cost	Monthly Energy Savings	Payback Period (Years)	Notes
Rooftop Solar	$20,862[33]	$232	7.3[34]	Average installed cost in the SF Bay area according to EnergySage.
Full Market Price Plug-In Solar (no subsidies or incentives)	$2,364	$27	7.3	Includes mounting and installation; no Bright Saver subsidies or government incentives.
Bright Saver (subsidized price)	$1,772	$27	5.5	About 41% cheaper per kW than local rooftop solar.
Hypothetical H.B. 340-Style Policy in CA	$622.91	$27	1.92	Assumes legislative reform in CA similar to Utah's H.B. 340 and no subsidies or incentives.

Another homeowner, Tiffany of Richmond, California, also pointed to the total price tag for plug-in solar compared to rooftop solar as her primary reason for choosing plug-in solar.

> "We aren't quite ready to splurge on roof units so this is a really great option which will allow us to get some solar power in the house and save some money for the increasing electric bills that we've been having."

Bright Saver is also bringing plug-in solar to renters. Sean, a tenant in Concord, California, whose system was installed in April 2025, shared,

> "I tried to convince my landlord to get rooftop solar but he didn't want to do it. During the middle of a summertime, our monthly PG&E bill is near $400. It's ridiculous. We tried to keep the AC off as much as possible, but we both work from home and it gets hot. So I did the quick math and figured that at least for the summer, it becomes worth it."

Bright Saver's California pilot demonstrates strong demand for solar alternatives beyond rooftop systems. Participants overwhelmingly pointed to overall affordability and accessibility as their primary reasons for choosing plug-in solar. Most had previously considered rooftop solar but found it out of reach due to high costs, unsuitable roofs, or rental status. Across the board, rising energy bills were a key motivator for seeking a solar solution.

VI Modeled National Impact of H.B. 340-Style Legislation on Plug-In Solar Accessibility

In all U.S. states other than Utah, outdated interconnection guidelines leave the consumer three options:

1. Apply for interconnection. This is typically a cumbersome process that sometimes requires a building permit and electrical drawings. Moreover, it's expensive relative to the cost of small plug-in solar systems and some utilities impose monthly fees on interconnected systems which will consume a significant portion of the savings from energy generation.
2. Use a more expensive system with backfeed prevention, which must be professionally installed and exists in a regulatory gray area in most states, despite being nearly impossible to detect by utilities.
3. Install a plug-in system that is so small that the system's energy production matches the household's baseload — the steady background demand from appliances like refrigerators and always-plugged-in devices. This system is also nearly impossible to detect and exists in the same regulatory gray area as systems with backfeed prevention.

Legislation similar to H.B. 340 will immediately cut the cost of plug-in systems by roughly half in every state in which it is adopted. There are two reasons for this:

- The most advanced and lowest-cost systems that are currently only available in Utah will be available in the states in which such legislation is enacted.
- The cost of professional installation and backfeed prevention hardware components will be eliminated, allowing customers to self-install their own systems.

Moreover, within a year of H.B. 340-style legislation being enacted in five or more states, we expect mainstream retailers to begin offering complete systems at, or even below, today's individual component-level retail prices via bundling discounts. In other words, within 12 to 24 months of reform in 5+ states, plug-in systems will become available in all states that have passed reforms for roughly one-quarter of the cost per watt of plug-in systems available in all 50 states today. In addition, many savvy DIY-ers won't wait for mainstream retailers to bundle plug-in solar as kits; instead, they will quickly begin assembling systems from off-the-shelf components — cutting costs by as much as 75% compared to the retail costs of plug-and-play systems that are available in all 50 states today just months after passage of reform, as we are already seeing in Utah.

Table 2 compares the cost of all plug-in systems without batteries currently available in the U.S. to traditional rooftop solar without batteries. Costs for plug-in solar include mounting hardware and 7.1% average sales tax. All plug-in solar figures account for tariffs as of September 2025 and reflect current prices without tax credits or incentives. The rooftop solar average costs are national averages without incentives or tax credits.

TABLE 2.
TOTAL COST COMPARISON: PLUG-IN SOLAR SYSTEM TYPES VS. ROOFTOP SOLAR

System Type	Current Availability	System Size	Total Price	Price per W	Notes
Low-Wattage Plug-In Solar (with or without reform)	Available in all 50 U.S. States	200 W	$599[35]	$2.99	Self-installation, small amounts of backfeeding possible
Plug-In Solar (without reform)	Available in all 50 U.S. States	800 W	$2,375[36]	$2.97	Price includes backfeed prevention hardware and its installation costs.
Plug-In Solar (with reform)	Available in Utah Only	800 W	$1,263[37]	$1.58	No backfeed prevention, self-installation, ground mount included in price
Hypothetical Plug-In Solar (with reform in 5+ states[38])	Not Available	800 W	$565[39]	$0.71	No backfeed prevention, self-installation, ground mount included
Plug-In Solar (Germany)	Not Available in U.S.	800 W	$496[40, 41, 42]	$0.62	Same product as offered in Utah
Rooftop Solar (U.S. average)	Available in all 50 U.S. States	8 kW	~$25,200	$3.15[43]	NREL 2024 data normalized to 8 kW system

All in all, passing legislation modeled on H.B. 340 in five or more states would catalyze a far larger market transformation than Utah's reforms alone. While Utah currently has only one supplier offering complete plug-in solar systems, multi-state adoption would quickly attract additional manufacturers to the U.S. market. Once multiple suppliers begin offering complete packages, we project that system costs will quickly fall to today's component-level retail prices.

We project per-watt prices in the U.S. would approach German levels within twelve to twenty-four months of reform in a critical mass of states and continue to decline along the trajectory predicted by Wright's Law — assuming a 14% learning rate and a doubling of cumulative production every 2.5 years, more conservative assumptions than the observed historical average doubling time of 2 years and historical learning rate of 20%, reflecting our projection that global cumulative production will continue to increase though at a slightly lower rate than it has over the last decade. Detailed cost and adoption projections are presented in Section VIII.

VII Scaling Plug-In Solar
Cost Projections, Market Adoption, and Energy Affordability

As of this writing, plug-in solar costs per watt are roughly on par with traditional rooftop solar in 49 of the 50 states. However, in Utah, the only state with modernized regulations, plug-in solar is available — just months after the passage of H.B. 340 — for roughly half the cost per watt. We view this as a still-inflated price, driven by the fact that only a single manufacturer has entered the U.S. market in just one state.

In Utah currently, the combination of low cost per watt and the convenience of self-installation for the consumer satisfy two of the three primary drivers of exponential adoption in Germany. However, with some of the lowest energy prices in the nation, Utah is missing the third driver: short payback periods.

States that adopt reforms modeled on Utah's H.B. 340 can expect plug-in solar system costs to fall by about 50% immediately, since the technology already proven in Utah can be deployed elsewhere without delay. Once a critical threshold is reached — five or more states enacting similar reforms — manufacturers are expected to enter the U.S. market at scale. In line with Wright's Law (assuming a 2.5-year doubling rate), this rapid expansion is likely to drive costs down even further, reaching roughly one-quarter of today's prices within a year. Beyond this initial price drop, costs are expected to continue declining over time according to the market dynamics described below.

In order to project cost reductions and adoption rates for plug-in solar systems in the U.S. over the next decade, once rational market forces are no longer inhibited by outdated regulations, we analyze historical cost and adoption trends for residential solar in three distinct markets:

1. Global trends.
2. U.S. residential rooftop trends.
3. German plug-in solar trends.

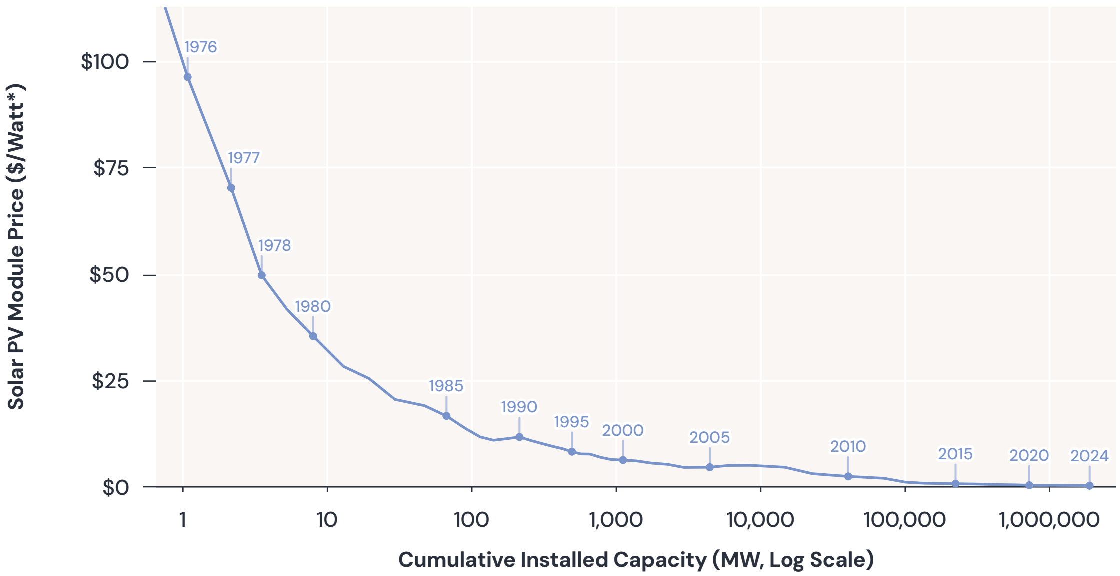
Note that we adjust for the confounding influence of labor costs, particularly in the U.S., since these projections assume a policy environment shaped by Utah-style regulatory reforms, effectively removing labor costs from the equation. Our analysis and modeling does not include battery storage.

GLOBAL SOLAR COST TRENDS

The cost of solar modules has declined precipitously, with global average spot prices declining from $76.67/watt in 1977[44] to an average of $0.11/watt in 2024.[45, 46] These price declines follow Wright's Law, an economic experience curve model, which predicts that the cost of a manufactured product decreases by a constant percentage with each doubling of cumulative production. This trend reflects the effects of learning, process optimization, and economies of scale that occur as more units are produced over time and with additional investment. In the solar industry, the historical price of photovoltaic modules has indeed declined by roughly 20% with each doubling of cumulative global production — a trend known in the solar industry as Swanson's Law, named for SunPower founder Richard Swanson, who first described the trend.[47]

Figure 5 shows the global cost declines of solar modules, fitting Wright's Law and Swanson's Law predictions of a 20% learning rate.[48]

FIGURE 5.
GLOBAL SOLAR PV MODULE PRICE VS. CUMULATIVE INSTALLED CAPACITY, 1976-2024[49]



SOURCE: OUR WORLD IN DATA, IRENA (2025); NEMET (2009); FARMER AND LAFOND (2016) *IN 2024 U.S. DOLLARS

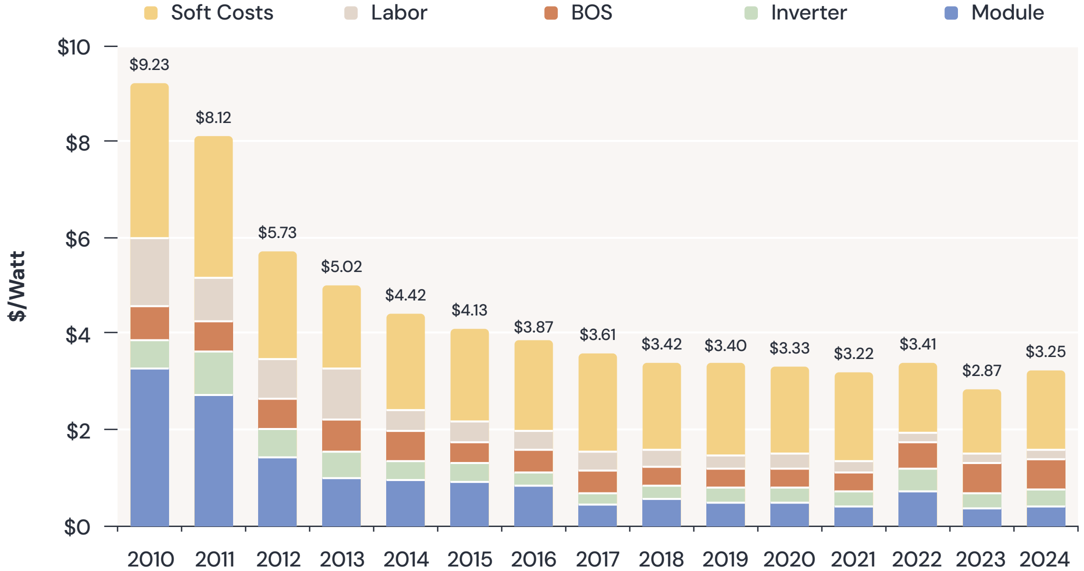
COST AND ADOPTION TRENDS IN THE U.S.

The global cost trend holds for PV hardware in the United States, generally following Wright's and Swanson's Law. As reported by the National Renewable Energy Laboratory (NREL), the inflation-adjusted price of solar modules fell dramatically — from about $96 per watt in the mid-1970s to roughly $0.30 per watt in 2018, and further to around $0.20 per watt by 2020.[50, 51]

However, while solar hardware is getting cheaper, soft costs inflate system prices and create a ceiling for price declines in the U.S. Still, a combination of policy incentives and manufacturing efficiencies have led to overall cost decreases in the average installed cost of rooftop solar in the U.S.[52] Decreases in hardware costs are the primary driver of these price declines, with module prices alone dropping by roughly 90% in the past 15 years.[53] However, soft costs remain high, constituting an estimated 40-65% of total system costs in the U.S.[54, 55]

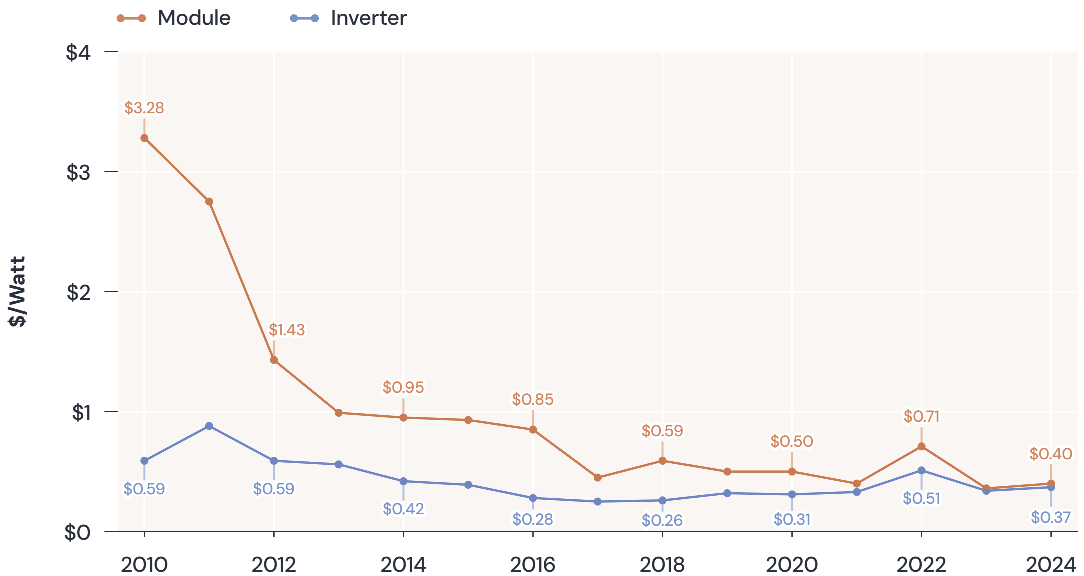
Figure 6 and Figure 7 visualize the cost declines in rooftop solar hardware and soft costs in the U.S. over the last decade and a half, according to NREL reports from 2020 and 2021.[56]

FIGURE 6.
U.S. RESIDENTIAL PV INSTALLED SYSTEM COST BREAKDOWN, 2010–2024[57]



SOURCE: NREL (2025)

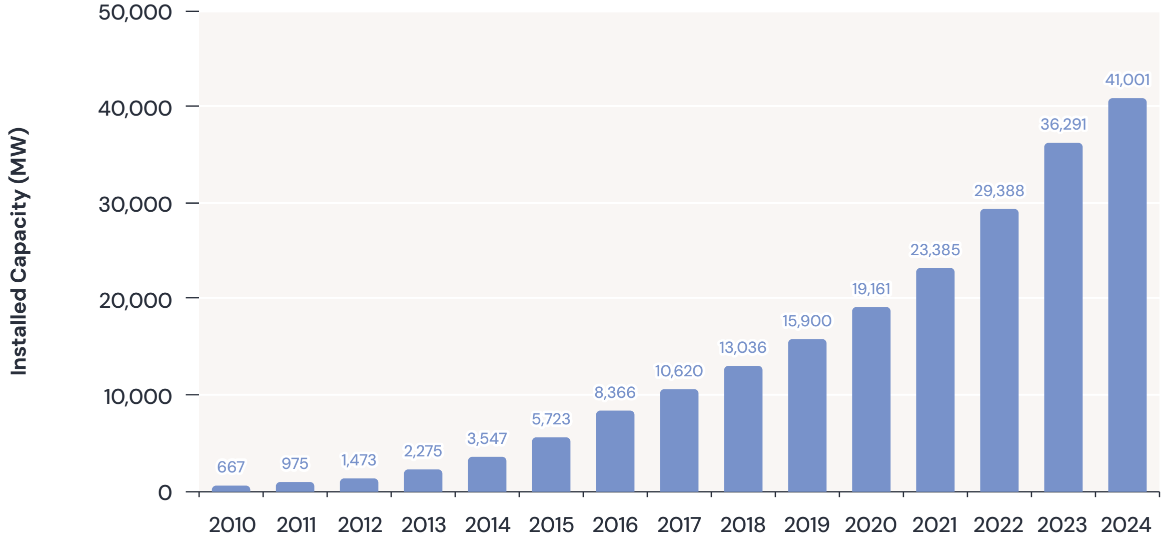
FIGURE 7.
U.S. MODULE AND INVERTER COST, 2010–2024[58]



SOURCE: SEIA/WOOD MACKENZIE

Predictably, as hardware costs in the U.S. have fallen, both adoption rates and residential solar capacity — measured in installed megawatts — have increased substantially over the past 14 years, according to the NREL reports from 2020 and 2021 cited earlier.

FIGURE 8.
CUMULATIVE U.S. RESIDENTIAL INSTALLED CAPACITY, 2010–2024[59]



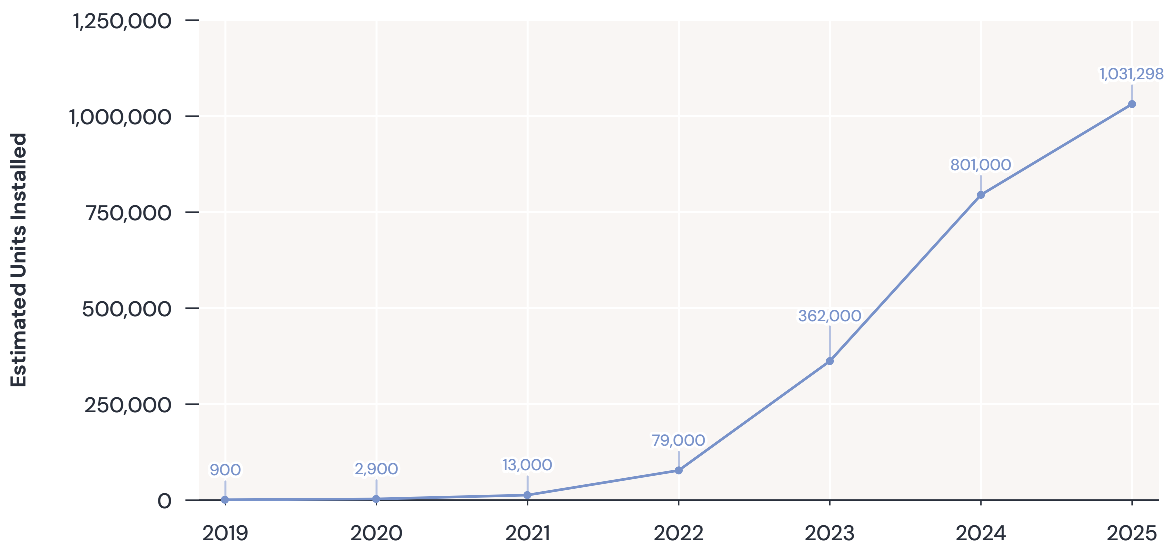
SOURCE: SEIA/WOOD MACKENZIE

HISTORICAL COST DECLINES AND ADOPTION TRENDS OF BALCONY SOLAR IN GERMANY

Germany's adoption of balcony solar systems (*Balkonkraftwerke*) has surged over the past four years, fueled by spiking energy prices, sharp cost declines in hardware, and legislative reforms that clarified regulatory uncertainties.

In 2019, installations were virtually nonexistent. As of 2025, Germany has approximately one million registered balcony solar units. However, the actual number of plug-in PV systems — including both registered and unregistered units — is estimated to be far higher, as many as 4 million,[60] according to HTW Berlin's *Forschungsgruppe Solarspeichersysteme*. That amounts to 9% to 10% of all German households[61] — nearly 1000× growth in six years.

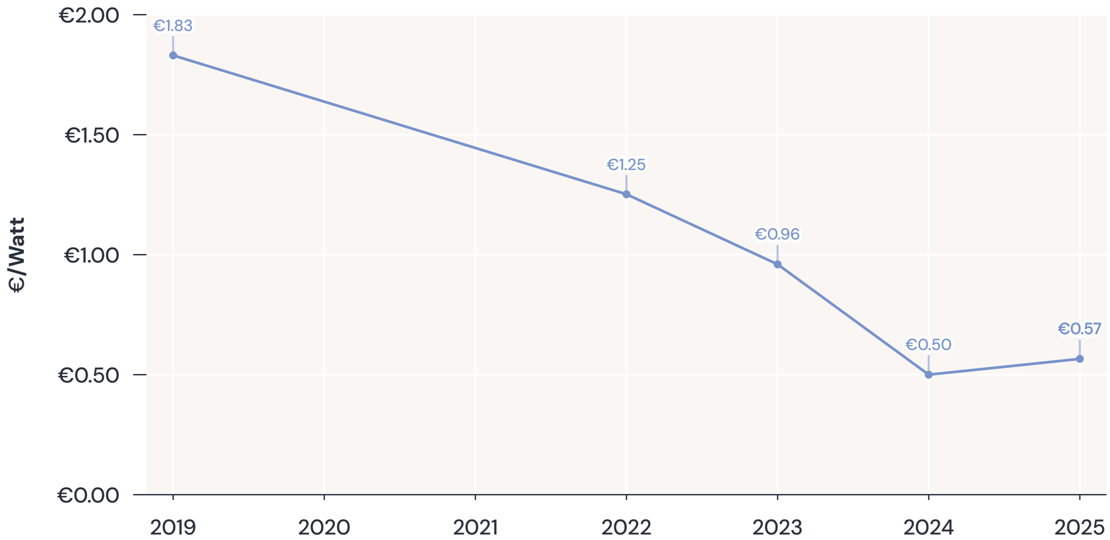
FIGURE 9.
REGISTERED BALCONY SOLAR UNITS IN GERMANY, 2019–Q2 2025[62]



SOURCE: UMWELTBUNDESAMT (UBA) 2025, BUNDESNETZAGENTUR MASTR (2025), BSW-SOLAR (2025)

As adoption rates of balcony solar in Europe surged, prices predictably declined. In Figure 10, we graph the price per watt of balcony solar kits in Germany based on publicly available data and industry reports.[63] The most dramatic price drop occurred between 2022 and 2025, which corresponds to the widespread market adoption of this technology.[64]

FIGURE 10.
COST PER WATT OF GERMAN BALCONY SOLAR, DOCUMENTED RANGES 2019–2025[65]



SOURCE: PRIWATT, HTW BERLIN, BUSINESS INSIDER, HEISE ONLINE, ADAC, FINANZTIP

The cost declines of balcony solar systems in Germany shown in Figure 10 are best explained by a combination of Swanson's Law and Wright's Law. As production volumes increased and supply chains matured, manufacturers achieved efficiencies in assembly, design standardization, and logistics. Together, these dynamics help explain how full balcony solar kits declined in cost from over €1,200 to under €550 in 2024[66] with some discounted systems reaching as low as €200. This dual framework of technological learning and industrial scaling provides a robust lens through which to understand and forecast further declines in plug-in solar costs.

This observational data on plug-in solar cost trends in Germany indicates that Wright's Law accurately describes the declines, suggesting a learning rate of approximately 20%. If the U.S. follows in Germany's footsteps and enacts regulatory reform in 5 or more states, we expect to see similar but not identical cost declines and increased adoption rates.

Specifically, U.S. adoption may ramp more slowly at first due to factors such as a more diverse housing stock and more regulatory restrictions in HOAs and multifamily units. The U.S. also faces greater market fragmentation, with decentralized utility oversight that could create regional variation in adoption speed. That said, price declines and adoption rate increases are likely to mirror Germany's closely after initially slower adoption rates, driven by the same global manufacturing cost trends and learning curves. Over time, as distribution channels mature and awareness grows, the U.S. adoption curve, we project, will surpass Germany's in total volume, reflecting the country's larger housing base and vast solar potential.

U.S. COST PROJECTIONS 2026-2035

For projecting U.S. cost trajectories, we assume that complete systems will follow the similar learning rates and doubling times observed historically for individual solar components.

Today, the component costs for a typical 800-watt plug-in system are approximately:

- Two 400-watt solar panels: $239.40 (≈45% of total cost)[67]
- Inverter (including accessories): $207.85 (≈40% of total cost)[68]
- Mounting set: $79.99 (≈15% of total cost)[69]

Global trends suggest that the learning rate for complete plug-in systems will track a weighted average of their three primary hardware components. In contrast to the observed learning rates for PV modules domestically and globally, the learning rate for inverters has been observed to be significantly lower.[70] Primarily, this is because inverters are more complex electronic components with more variation in design (e.g., string inverters vs. microinverters) and manufacturing processes don't scale with the same efficiency as PV modules. Inverter costs are also more susceptible to fluctuations in the prices of key materials like copper and other electronic components. Similarly, cost declines in mounting hardware will be more modest than observed cost declines for PV modules.

Applying Wright's Law, we project a 14% cost reduction with each doubling of cumulative global production, occurring roughly every 2.5 years. This estimate is intentionally conservative — well below the 20% learning rate and 2-year doubling period for solar modules observed in global trends over last decade. This more conservative projection reflects a mix of components with slower cost declines in mounting hardware and inverters relative to PV panels.

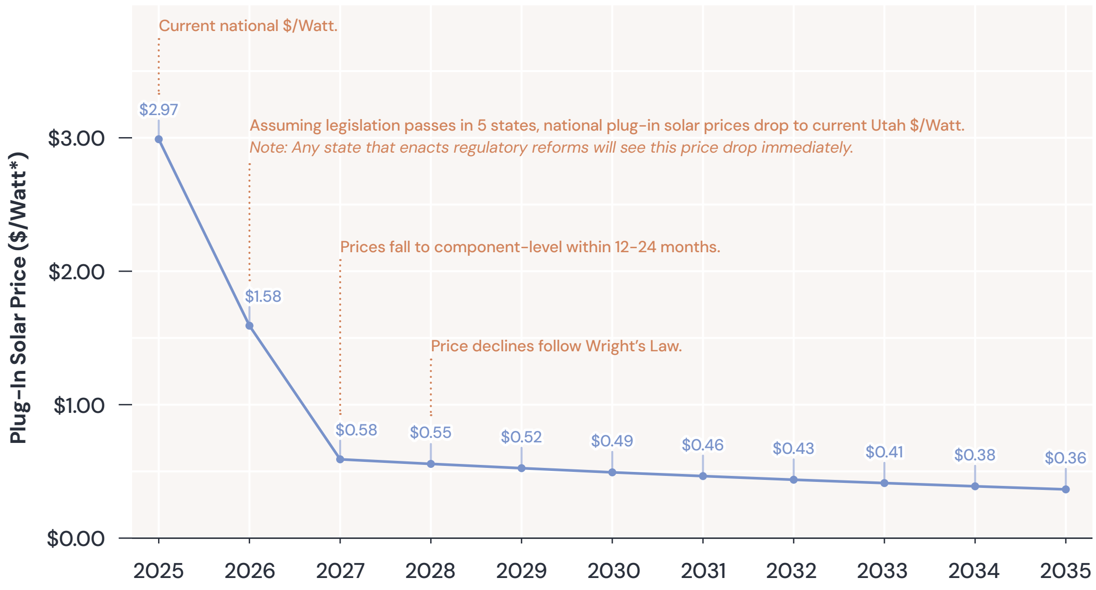
Taken together, we project that with regulatory reform, the cost of approximately $3 per watt for plug-in solar kits available today in all 50 states will decrease as such:

- The cost of complete plug-in solar systems will fall within months by roughly 50% in any state that enacts reform.
- The cost of DIY plug-in solar systems will also fall within months in any state that enacts reforms to component-level costs, which are roughly 25% of today's costs for complete systems.
- Within 12-24 months of five or more states enacting reform, complete appliance-like plug-in solar kits will be available in every state that has enacted reforms at roughly 25% of today's costs as market forces drive down prices through competition among multiple manufacturers.
- Over the longer term, prices will continue to drop according to Wright's Law.

Without regulatory reform in the U.S., solar components will continue to follow global learning curves and cost declines, but consumers in the U.S. will not fully benefit until a viable market emerges. That is, individual components are already part of global mass markets, and their prices decline as worldwide production grows. However, a complete plug-in solar system functions more like an appliance: an integrated package of panels, inverters, mounts, and accessories sold as a single unit. For these systems, cost reductions are not driven solely by the price of global components but also by economies of scale in design, assembly, distribution, and retail. These system-level efficiencies will only materialize once manufacturers see a large enough U.S. market to justify entry — and that threshold, according to the industry insiders cited earlier, is at least five states. The bottom line: U.S. consumers will not see the real benefits of cost declines of plug-in systems until reforms are widespread enough to create a competitive, appliance-like market for these systems.

Figure 11 illustrates projected cost declines for these complete appliance-like systems over the next decade.

FIGURE 11.
PROJECTED PLUG-IN SOLAR PRICES IN THE U.S., 2025-2035



SOURCE: BRIGHT SAVER *IN 2024 U.S. DOLLARS

Crucially, our cost projections will only follow the curve in Figure 11 once regulatory reform has been achieved in the critical mass of 5 states or more. Until we reach that threshold, rational market forces will be inhibited and costs will decline more slowly.

PLUG-IN SOLAR PAYBACK PERIOD AND ADOPTION PROJECTIONS IN THE U.S. 2026-2035

Economics — more than climate concern — is the driving force behind our adoption projections. For households, the key metric is payback time: how long it takes for energy bill savings to cover the upfront cost. Once payback falls to roughly three years,[71] adoption accelerates dramatically. At this critical 3-year threshold, we project that plug-in solar will shift from being seen as a long-term investment to a straightforward, cost-saving appliance.[72] In this respect, the trajectory mirrors earlier consumer shifts toward energy-efficient refrigerators or LED lighting: once the economics tip decisively, behavior follows quickly.[73]

In Figure 12, we project the national average payback period for an 800-watt plug-in solar system over the next decade. Payback period is defined as the time it takes for cumulative energy bill savings to equal the initial cost of the equipment, assuming no subsidies, incentives, or tax credits.

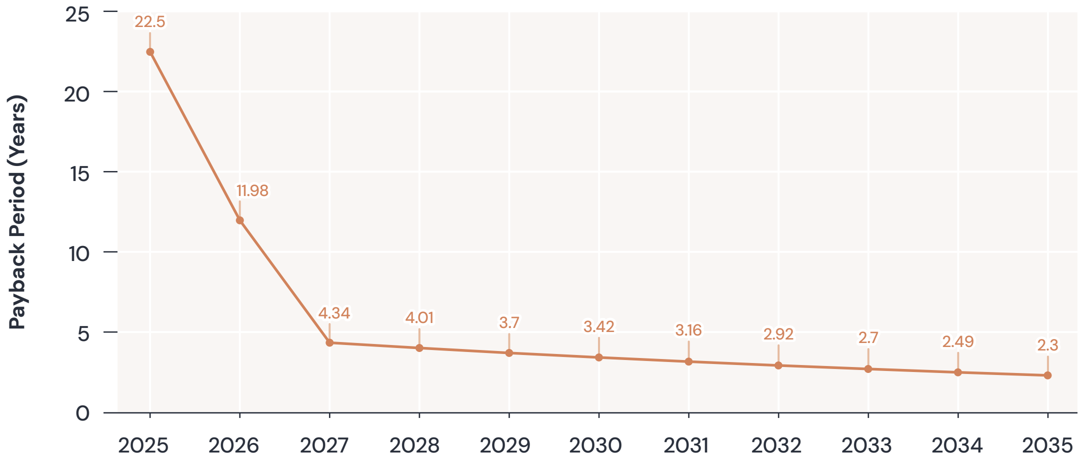
In our payback period projections, we consider four factors:

- **Electricity prices** on average nationally and as projected over the next decade.
- **Average daily sun hours nationwide**, used for solar generation potential calculations.
- **Total system cost**, both current and according to our cost-reduction projections over the coming decade.
- **Levelized Cost of Energy (LCOE)**, the average cost per kilowatt-hour (¢/kWh) a system produces, calculated by dividing total lifetime costs (capital, operations, maintenance) by total lifetime electricity generated over the expected 10-20 year system lifetime. Adoption is then modeled as a function of payback, with adoption ceilings and ramp speeds ("gammas") calibrated to historical precedents and global analogs.

States with today's highest electricity prices, such as California and Hawaii, are projected to reach the critical 3-year threshold almost immediately after regulatory reform. In Bright Saver's California pilot, for example, we saw that Terry in Oakland would see his payback period drop from 7.3 years to 1.92 years if 5+ states including California allowed German-style systems without costly backfeed-prevention hardware and the added expense of a professional electrician.

Overall, we project that the national weighted average payback period will fall to about 2.37 years by 2035 — provided that at least five states enact regulatory reform by the end of 2026. If reforms are delayed, payback periods will not begin to decline along this curve until at least five states have enacted reforms.

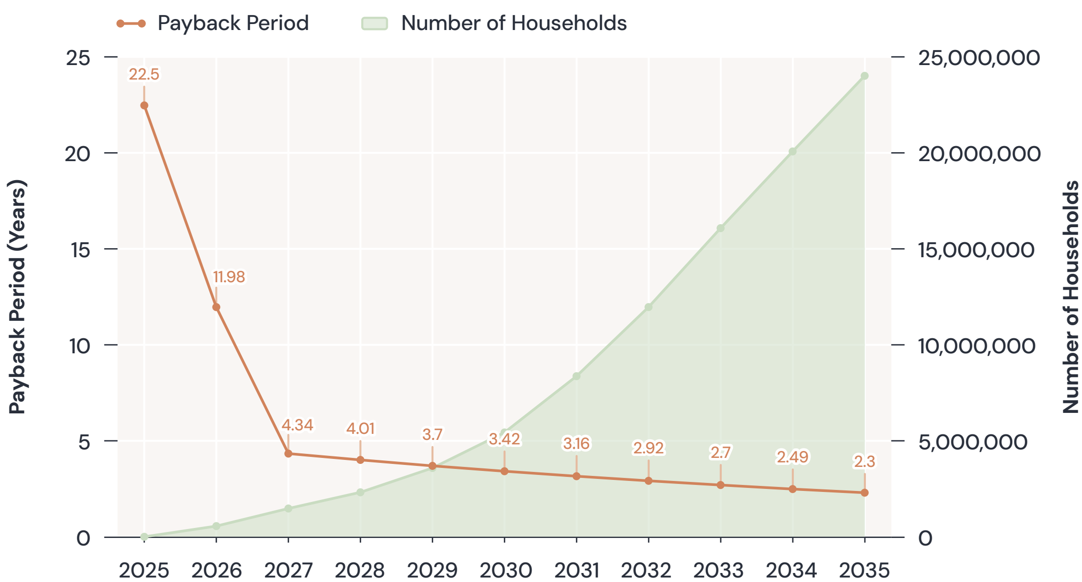
FIGURE 12.
PROJECTED NATIONAL AVERAGE PAYBACK PERIOD FOR 800W PLUG-IN SOLAR, 2025-2035



SOURCE: BRIGHT SAVER

As national payback periods decline, household adoption based on economic purchase rationale is projected to increase. In Figure 13, we project national balcony solar household adoption through a calibrated Bass diffusion model. Our adoption rate projections follow a classic S-curve: slow at first, then accelerating as payback periods cross 4- and 3-year thresholds. By 2030, we project that approximately 5.4M households under a 2% electricity-rate growth path will have adopted plug-in solar. By 2035, we project that approximately 24M households — 60 million or 1 in 6 Americans — will have plug-in solar units.

FIGURE 13.
PROJECTED PLUG-IN SOLAR PAYBACK PERIOD & HOUSEHOLD ADOPTION, 2025-2035



SOURCE: BRIGHT SAVER

Germany's experience further corroborates our modeling. In 2019, before regulatory reforms enabled the market, adoption was estimated to be in the thousands. Following the 2019 and 2024 regulatory reforms, adoption surged to an estimated 4 million units between 2019 and 2025 — reaching an estimated 9-10 percent of German households today. Overall, both Germany's observed adoption rates and our Bass diffusion modeling converge on similar projections, as seen in Figure 13.

Taken together, these projected cost per watt and payback period declines and concomitant adoption surges point to a decisive inflection point for plug-in solar — and, we argue, for clean energy writ large. With regulatory reform in five or more states, plug-in solar costs are projected to fall to one-quarter of rooftop solar on a per-watt basis within two years. At that stage, clean energy shifts from being primarily a climate-driven choice to one motivated by household cost savings, triggering a virtuous cycle: mass adoption drives competitive price declines, which in turn spur even wider adoption.

Utah's H.B. 340 demonstrates the proof of concept, and the U.S. market is now poised to follow Germany's trajectory of rapid price declines and widespread adoption — provided additional states enact reforms. Once the five-state threshold is crossed, manufacturers are likely to commit fully to the U.S. market, and hardware learning curves and scale effects will push costs below $1 per watt within a year of reforms and well below $0.50 per watt within a decade. Household payback periods will drop under three years nationwide, and adoption will accelerate along a classic S-curve. In short, modernizing state regulations will determine whether plug-in solar remains a niche product or emerges as a mainstream technology reshaping America's residential energy landscape.

VIII Cost-Benefit Synopsis

NO FISCAL IMPACT, HIGH BENEFIT TO THE PUBLIC

Legislation like Utah's H.B. 340 (2025) is cost-neutral for local, state, and federal budgets. Unlike traditional rooftop solar — which often depends on upfront incentives or long-term incentives to remain affordable — plug-in solar systems do not require public or private financial support to be within reach for the majority of the U.S. population. This means that, regardless of political shifts, adoption of plug-in solar can be driven directly by consumer demand, provided outdated regulations are updated.

PUBLIC BENEFITS

The societal and grid-level benefits of plug-in solar deployment are substantial:

- **Lowered Household Energy Burden:** These systems allow households — especially those traditionally excluded from solar access — to significantly reduce electricity bills.
- **Grid Stability and Demand Management:** Distributed generation at the edge of the grid can reduce local loads and defer costly infrastructure upgrades.
- **Resilience:** When paired with a battery, backup enhances household-level energy security during power outages.

GRID RESILIENCE AND INFRASTRUCTURE BENEFITS

Widespread on-site generation reduces strain on the aging national grid, enhancing resilience for consumers and utilities alike. Distributed plug-in solar with integrated batteries helps utilities by easing peak demand, extending the lifespan of existing infrastructure, and deferring costly upgrades to transmission and distribution lines.

With reforms including interconnection exemptions, excess electricity from plug-in solar can flow back into the grid without requiring utilities to provide compensation, effectively supplying them with supplemental energy at no additional cost — unlike traditional net metering arrangements.

BRIGHT SAVER

IX Equitable Impact
Constituent-Level Benefits and Demographic Reach

EXPANDING ACCESS

Plug-in solar offers a practical energy solution for communities traditionally locked out of solar energy generation, including the following groups:

- **Renters in Urban and Suburban Areas:** Nationwide, low-to-moderate income communities are disproportionately renters.[74] Plug-in systems will give renters the opportunity to reduce their electricity bills as energy rates climb.
- **Remote and Diesel-Dependent Communities:** In Alaska, where energy is often supplied by high-cost diesel generation, even modest solar offsets can deliver outsized economic benefits. Plug-in solar when combined with battery backup also enhances resilience where infrastructure is vulnerable.
- **Tribal Households:** In New Mexico and Colorado, many indigenous communities face high energy burdens. Plug-in systems provide an affordable entry point for energy autonomy and cost relief.
- **Fixed-Income Seniors:** In all states, senior citizens living on fixed incomes face unique energy insecurity. Rising bills can quickly reduce Social Security or retirement savings. Plug-in solar provides a way to stabilize costs, reduce monthly expenses, and — when paired with batteries — offer resilience during outages.
- **Medically Vulnerable Populations:** Millions of Americans depend on electricity for medical equipment and refrigerated medicines. For them, outages are life-threatening. Plug-in solar with batteries provides a vital and affordable backup, ensuring continuity and independence during blackouts and energy savings throughout the year.
- **High-Heat Geographies:** In the South and Southwest, extreme heat makes air conditioning a necessity — but high cooling demand drives up bills and strains the grid, leading to frequent blackouts and brownouts, particularly in the summer months. Plug-in solar can offset daytime cooling loads, cut costs, and ease peak demand.

X Policy Recommendations

To enable equitable access to solar energy while ensuring safety and regulatory clarity, we recommend that states:

1. **Define a new class of small photovoltaic systems no larger than 1,200 watts.**
2. **Exempt these small systems from utility interconnection requirements.**
3. **Exempt these small systems from net metering.**

In sum, plug-in solar systems represent a transformative opportunity to democratize access to clean, resilient energy. By offering an affordable, scalable alternative to traditional rooftop solar, these systems lower the barriers for renters, low-to-moderate income households, and communities struggling to achieve energy independence.

As electricity prices rise and hardware costs decline, the economic case for plug-in solar will only grow stronger. However, realizing this potential requires action: lawmakers, regulators, and utilities must update outdated policies and remove unnecessary restrictions. With thoughtful regulatory reform, plug-in solar can serve as a powerful tool for advancing energy affordability, household resilience, and energy independence — bringing the benefits of solar within reach for millions more Americans.

Once one-size-fits-all regulations are updated, the impact of plug-in solar will be massive — gigawatts of affordable energy annually, greater grid resilience, billions in cumulative household savings and in avoided utility upgrades.

Sharp cost declines and exponential adoption rates will be driven by self-sustaining market forces. As energy prices rise and hardware costs decline, we project that national weighted average payback periods will fall to ~4 years by 2028 and ~3 years by 2032. With such regulatory reform, by 2035, one in six Americans — 60 million people — are projected to live in homes with plug-in solar. But this outcome depends on swift action by policymakers in a critical mass of states.

Appendix

ROOFTOP EXCLUSION

Because datasets are potentially overlapping, there's no perfect or precise calculation for the percentage of Americans who can't access rooftop solar. However, we use a range of government and industry data to quantify solar exclusion.

1 **Baseline Availability**
A detailed 2015 Analysis by the National Renewable Energy Laboratory (NREL) estimated that approximately 37% of Americans are renters and/or reside in a building with more than three stories.[75] These figures are consistent with more recent Census data, which indicate that 35% of Americans are renters.[76] As of 2020, there were 122 million occupied households, of which 82 million (67%) are detached, single-family homes — a figure roughly on par with the 63% of homes NREL estimates are solar-eligible based on dwelling type and ownership status. Of that eligible 63%, NREL found that 81% have enough suitable roof space to host a 1.5-kW PV system or larger. Therefore, we estimate that at a minimum, only 51% of American households can install rooftop solar.

Calculation: 63 × 0.81=51.03% of homes potentially able to install solar.

2 **Roof Quality**
While this estimate accounts for home ownership status, number of stories, and roof size, it does While this estimate accounts for home ownership status, number of stories, and roof size, it does not account for roof condition. Roofs that are at too steep an angle, are overly shaded (by trees or other buildings), or receive inadequate solar exposure are also unsuitable for solar. Roof age further compounds solar accessibility. A common insurance benchmark for roof coverage is 15-20 years;[77] data about roof conditions is spotty,[78] but several surveys and market reports indicate that about 25% of American homes have a roof old enough to warrant replacement.[79] Roof costs vary by region and roof type, but average around $11,000.[80] According to the Rocket Homes survey, 43% of homeowners cited roof replacement as the reason they're not getting solar.[81] If we apply roof condition data to NREL's eligibility numbers, approximately 38.25% of U.S. households are eligible for solar.

3 **Access to Financing**
Up-front costs remain a key barrier to solar adoption. The average cost of an 8 kW rooftop system is around $25,000-$40,000 before incentives Table 2). This high price tag is often a financial barrier, as roughly 80% of homeowner-owned solar systems are financed with loans. For many, financing is not an option: an Urban Institute report found that 19% of homeowners have a credit score below 650, which often disqualifies them from receiving loans with favorable terms. Due to these financial and structural barriers — including rental status, unsuitable roofs, and lack of access to affordable financing — approximately 70% of Americans are unable to participate in the rooftop solar market.

Up-front costs remain a key barrier to solar adoption. The average cost of a 8kW rooftop system is around $25,000-$40,000 before incentives.[82] However, these figures do not include financing costs, and roughly 60% of homeowner-owned solar systems are financed through loans.[83] According to a report by the Urban Institute, 19% of American homeowners have a credit score below 650,[84] creating additional burdens to solar access. Therefore, we estimate that approximately 70% of Americans are effectively excluded from the residential solar market.

Why do we round down to 30 and not up to 31?

The 25% rooftop replacement figure accounts for roofs that need to be replaced immediately; however, the average lifespan of a rooftop solar system is approximately 20-25 years (much like a roof); it's therefore reasonable to speculate that at least some portion of homes have a roof that's about 10-15 years old — too new to need immediate replacement, but also too old for solar to be installed. We don't have good figures to calculate this, but the general trend means we are comfortable rounding that 30.78% down to 30%, yielding a more even estimate of 70% for households that are ineligible for solar.

END NOTES

1 Average residential electricity rates in 2024 were 16.48 cents per kWh and 13.01 in 2019. This difference of 3.47 cents represents a 26.67% increase in the cost of electricity compared with 2019. U.S. Energy Information Administration (EIA). “Table 5.3. Average Price of Electricity to Ultimate Customers.” In *Electric Power Monthly*. April 2025. https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_3.

2 U.S. Energy Information Administration (EIA). “U.S. Electricity Prices Continue Steady Increase.” *Today in Energy*. May 14, 2025. https://www.eia.gov/todayinenergy/detail.php?id=65284.

3 Smart Energy Consumer Collaborative (SECC), *2025 State of the Consumer Report*, March 17, 2025, https://smartenergycc.org/2025-state-of-the-consumer-report; summary in T&D World, “SECC Survey: One-Third of Americans Report Difficulty Paying Electric Bills,” May 8, 2025, https://www.tdworld.com/utility-business/news/55288973/secc-survey-one-third-of-americans-report-difficulty-paying-electric-bills.

4 McKinsey & Company, “Residential Solar: Down, Not Out,” February 3, 2025, https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/residential-solar-down-not-out.

5 Solar Energy Industries Association (SEIA), *Solar Market Insight Report Q2 2025*, June 10, 2025, https://seia.org/research-resources/solar-market-insight-report-q2-2025.

6 National Renewable Energy Laboratory (NREL), *Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation*, NREL/TP-6A20-63892 (Golden, CO: NREL, April 2015), https://docs.nrel.gov/docs/fy15osti/63892.pdf.

7 National Renewable Energy Laboratory (NREL), *Rooftop Solar Technical Potential for Low-to-Moderate Income Households in the United States*, NREL/TP-6A20-70901 (Golden, CO: NREL, April 2018), https://docs.nrel.gov/docs/fy18osti/70901.pdf.

8 Pew Research Center, *How Americans View National, Local and Personal Energy Choices*, June 27, 2024, https://www.pewresearch.org/science/2024/06/27/how-americans-view-national-local-and-personal-energy-choices/.

9 Ipsos, “Most Americans Report Higher Electricity, Gas Bills Compared to a Year Ago,” April 23, 2025, https://www.ipsos.com/en-us/most-americans-report-higher-electricity-gas-bills-compared-year-ago; Powerlines. *Utility bills are rising*. (2025, April). https://powerlines.org/wp-content/uploads/2025/04/PowerLines_Utility-Bills-Are-Rising_2025-1.pdf; SECC, *2025 State of the Consumer Report*.

10 Gallup, “Record-High 48% Call Global Warming a Serious Threat,” April 16, 2025, https://news.gallup.com/poll/659387/record-high-call-global-warming-serious-threat.aspx.

11 The most up-to-date numbers come from SEIA, which reports that, as of September 2025, there were 5,693,325 residential solar installations in the US. According to the US Census Bureau, there are 122 million occupied residential buildings in the US, and 82 million single family detached homes. Thus, 5,693,325/122,000,000 = 4.56%, and 5,693,325/82,000,000 = 6.78%. Solar Energy Industries Association (SEIA), *U.S. Solar Market Insight Report: Q3 2025*, September 8, 2025, https://seia.org/research-resources/us-solar-market-insight/; U.S. Census Bureau, “2019-2023 ACS 5-Year Estimates,” American Community Survey, December 12, 2024, https://acsdatacommunity.prb.org/discussion-forum/f/forum/1523/u-s-census-bureau-releases-2019-2023-acs-5-year-estimates.

12 U.S. Department of Energy, Solar Energy Technologies Office (SETO). The State of the Solar Industry. Washington, DC: U.S. Department of Energy, March 2024. https://www.energy.gov/sites/default/files/2024-04/Wed%20AM%20-%20Solar%20industry%20update.pdf.

13 NREL *Shared Solar* 2015

14 Data extrapolated from the most recent US Census 5-year housing survey, which indicates that there are 127,161,309 occupied housing units in the United States, of which 44,401,560 are renter-occupied ((44,401,560/127,161,309)*100=34.9%). U.S. Census Bureau, “2019-2023 ACS 5-Year Estimates.”

15 NREL *Shared Solar* 2015.

16 Gottlieb, Bryan. “New Report Says Many U.S. Homeowners Unsure of Roof’s Health.” *Roofing Contractor*. July 1, 2024. https://www.roofingcontractor.com/articles/99639-new-report-says-many-us-homeowners-unsure-of-roofs-health; Gitnux, *Roofing Industry Statistics: Market Data Report 2025*, April 29, 2025, https://gitnux.org/roofing-industry-statistics/.

17 Based on residential installed cost per watt data from NREL, Energy Sage, and SEIA/Wood Mackenzie. National Renewable Energy Laboratory (NREL). *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2023*. NREL/TP-7A40-87303. Golden, CO: National Renewable Energy Laboratory, September 2023. https://www.nrel.gov/docs/fy23osti/87303.pdf; EnergySage, “Solar Panel Cost in 2025: It May Be Lower Than You Think,” updated September 9, 2025, https://www.energysage.com/local-data/solar-panel-cost/; Wood Mackenzie, and Solar Energy Industries Association (SEIA). *US Solar Market Insight: Executive Summary, Q2 2025*. June 2025. https://seia.org/wp-content/uploads/2025/06/USSMI-Q2-2025-ES-Embargoed-with-Watermark.pdf.

18 Urban Institute. *Comparing Credit Profiles of American Renters and Owners*. Washington, DC: Urban Institute, March 2016. https://www.urban.org/sites/default/files/publication/78591/2000652-Comparing-Credit-Profiles-of-American-Renters-and-Owners.pdf.

19 See Appendix

20 A report from the Berlin University of Technology and Economics (HTW Berlin) Solar Research Group estimates that at the beginning of 2025, the total number of plug-in PV (registered plus unregistered) reached up to 4 million (up to 2.6 GW installed capacity). Hochschule für Technik und Wirtschaft Berlin (HTW Berlin). *Kurzbericht: Steckersolar 800 W*. Berlin: HTW Berlin, February 2025. https://solar.htw-berlin.de/wp-content/uploads/BERGNER-2025-Kurzbericht-800-W.pdf.

21 SolarPower Europe, *Plug-In Solar PV* (Brussels: SolarPower Europe, March 2025), https://api.solarpowereurope.org/uploads/Solar_Power_Europe_Plug_in_Solar_PV_Briefing_Paper_20250312_V02_6dbb591d88.pdf.

22 Solar panels produce direct current (DC), which must be converted by an inverter into alternating current (AC) — the form of electricity used in standard household wiring and appliances.

23 HTW Berlin, *Kurzbericht: Steckersolar 800 W*. 2025.

24 Bundesnetzagentur (Federal Network Agency). “Growth in Renewable Energy in 2024.” Press release. January 8, 2025. https://www.bundesnetzagentur.de/SharedDocs/Pressemitteilungen/EN/2025/20250108_EE.html.

25 Ibid.

26 Verivox, "Balkonkraftwerke Surpass One Million in Germany,” July 2, 2025. https://www.uisolar.com/balkonkraftwerke-surpass-one-million-in-germany-s-energy-shift_n130#:~:text=A%20typical%20800W%20system%20produces,kWh)%2C%20according%20to%20Verivox.

27 Ibid.

28 Kerim Baran (Founder, Enki Solar Investments), email message to Kevin Chou, September 3, 2025.

29 Meghan Wood (Cofounder of Raya Power), email message to Kevin Chou, September 5, 2025.

30 Anson Liang (Cofounder, Jackery), email message to Kevin Chou, September 3, 2025.

31 Note that payback periods vary widely state-to-state based on variations in electricity prices, solar potential, labor costs, and other factors.

32 Public Advocates Office, California Public Utilities Commission (CPUC), *Q1 2025 Electric Rates Report*, May 20, 2025, https://www.publicadvocates.cpuc.ca.gov/-/media/cal-advocates-website/files/press-room/reports-and-analyses/242005-public-advocates-office-q1-2025-rates-report.pdf.

33 EnergySage. "The Cost of Solar Panels in San Francisco, CA (2025)." Updated September 9, 2025. https://www.energysage.com/local-data/solar-panel-cost/ca/san-francisco-county/san-francisco/?utm.

34 EnergySage. "Solar Payback Periods Will Extend 43% Longer Without the ITC," July 7, 2025, https://www.energysage.com/blog/solar-payback-period-without-itc/.

35 Bright Saver, "Flex 200," product page, n.d., https://www.brightsaver.org/product-page/flex200, accessed September 12, 2025.

36 As of September 2035, only one model available, sold by CraftStrom, with $200 added for backfeed prevention hardware installation. CraftStrom, "Products," product catalog page, n.d., https://craftstrom.com/products/, accessed September 12, 2025.

37 As of September 2025, only one model available, sold by EcoFlow. EcoFlow, "STREAM Microinverter," product page, n.d., https://us.ecoflow.com/products/stream-microinverter, accessed September 12, 2025; $80 added for mounting hardware. EcoFlow. "STREAM Microinverter." Product page. n.d. https://us.ecoflow.com/products/stream-microinverter, EcoFlow.com.

38 Projected National Average cost to consumer 12-24 months after reforms in 5+ states.

39 Assumes resellers offer systems at today's component retail prices as described in section 7.

40 DAH Solar Co., Ltd., "Plug and Play Dah European Germany PV Kit Panel Mount Solar Balcony System 800W," product listing, n.d., https://dahsolar.en.made-in-china.com/product/DngrIYZKOmRe/China-Plug-and-Play-Dah-European-Germany-PV-Kit-Panel-Mount-Solar-Balcony-System-800W.html, accessed September 12, 2025. https://www.sveasolar-shop.com/product-page/stream-komplettset-s.

41 https://www.sveasolar-shop.com/product-page/stream-komplettset-s.

42 https://www.ebay.de/itm/235687744030?var=0&couponcode=ebay-voucher20183.

43 National Renewable Energy Laboratory (NREL), *Fall 2024 Solar Industry Update*, NREL/PR-7A40-92257 (Golden, CO: National Renewable Energy Laboratory, October 30, 2024), https://docs.nrel.gov/docs/fy25osti/92257.pdf.

44 The Economist. "Sunny Uplands: Alternative Energy Will No Longer Be Alternative." November 21, 2012. https://www.economist.com/news/2012/11/21/sunny-uplands.

45 U.S. Energy Information Administration (EIA). *International Energy Outlook 2000*. DOE/EIA-0484(2000). Washington, DC: U.S. Energy Information Administration, March 2000. https://rosap.ntl.bts.gov/view/dot/5104/dot_5104_DS1.pdf.

46 Gearino, Dan. "Solar Panel Prices Are Low Again. Here's Who's Winning and Losing." *Inside Climate News*. June 6, 2024. https://insideclimatenews.org/news/06062024/inside-clean-energy-solar-panel-price-drop/.

47 The Economist, "Sunny Uplands" and Financial Times, "Swanson's Law Provides Green Ray of Sunshine for PV." January 17, 2016. https://www.ft.com/content/d9f9f1b4-a3f0-11e5-873f-68411a84f346.

48 Richard M. Swanson, "A Vision for Crystalline Silicon Photovoltaics," *Progress in Photovoltaics: Research and Applications* 14, no. 5 (2006): 443-53, https://doi.org/10.1002/pip.709.

49 Ritchie, Hannah. "Solar Panel Prices Have Fallen by Around 20% Every Time Global Capacity Doubled." *Our World in Data*. June 13, 2024. https://ourworldindata.org/data-insights/solar-panel-prices-have-fallen-by-around-20-every-time-global-capacity-doubled. Citing data from: International Renewable Energy Agency (IRENA), *Renewable Power Generation Costs in 2022* (Abu Dhabi: International Renewable Energy Agency, August 2023), https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2023/Aug/IRENA_Renewable_power_generation_costs_in_2022.pdf; Santa Fe Institute, "Curve 158," *Performance Curve Database (PCDB)*, https://pcdb.santafe.edu/graph.php?curve=158; J. Doyne Farmer and François Lafond, "How Predictable Is Technological Progress?" *Research Policy* 45, no. 3 (2016): 647-665, https://doi.org/10.1016/j.respol.2015.11.001.

50 National Renewable Energy Laboratory (NREL), *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020*, NREL/TP-6A20-77324 (Golden, CO: National Renewable Energy Laboratory, January 2021), https://www.nrel.gov/docs/fy21osti/77324.pdf.

51 NREL, *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark Q1 2023*.

52 National Renewable Energy Laboratory (NREL), *Documenting 15 Years of Reductions in U.S. Solar Photovoltaic System Costs*, NREL/TP-7A40-92536 (Golden, CO: National Renewable Energy Laboratory, January 2025), https://www.nrel.gov/docs/fy25osti/92536.pdf.

53 Ibid.

54 NREL, *Fall 2024 Solar Industry Update* and SEIA, "Industry Trends Data," U.S. Solar Market Insight Report: Q3 2025.

55 SEIA, "Industry Trends Data," *U.S. Solar Market Insight Report: Q3 2025*.

56 National Renewable Energy Laboratory (NREL), *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks: Q1 2021*, NREL/TP-7A40-80694 (Golden, CO: National Renewable Energy Laboratory, November 2021), https://www.nrel.gov/docs/fy22osti/80694.pdf.

57 Figure A-5 in National Renewable Energy Laboratory (NREL), *Documenting 15 Years of Reductions in U.S. Solar Photovoltaic System Costs*, NREL/TP-7A40-92536 (Golden, CO: National Renewable Energy Laboratory, January 2025), https://www.nrel.gov/docs/fy25osti/92536.pdf.

58 Ibid.

59 Data aggregated from Statista, "Residential Solar Power Capacity in the United States," accessed September 24, 2025, https://www.statista.com/statistics/1401505/residential-solar-power-capacity-united-states/ and Wood Mackenzie and Solar Energy Industries Association (SEIA), *U.S. Solar Market Insight Executive Summary Q3 2025* (September 2025), accessed September 24, 2025, https://www2.seia.org/SMI-ES.

60 Renewable Energy Institute, "Accelerating Solar Adoption Through Plug-in PV: Insights from Germany's Rapid PV Growth (2023/2024)," May 8, 2025, https://www.renewable-ei.org/en/activities/column/REupdate/20250508.php.

61 According to the German Federal Statistical Office (Destatis), there were 40.998 million households at the end of 2024. Federal Statistical Office (Destatis), "Households, by type of household" (Microcensus table), accessed September 24, 2025, https://www.destatis.de/EN/Themes/Society-Environment/Population/Households-Families/Tables/households.html.

62 Umweltbundesamt (UBA), Steckersolargeräte: Entwicklung, Potenziale und Herausforderungen, by Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW) (Dessau-Roßlau: UBA, January 2025), https://www.umweltbundesamt.de/publikationen/steckersolargeraete-entwicklung-potenziale-und; Bundesnetzagentur, Marktstammdatenregister (MaStR): Electricity Generation Systems (Bonn: Bundesnetzagentur, ongoing), https://www.marktstammdatenregister.de; and Bundesverband Solarwirtschaft (BSW-Solar), "One Million Balcony Solar Power Plants in Operation in Germany," Photon.info, June 6, 2025, https://www.photon.info/en/news/bsw-solar-one-million-balcony-solar-power-plants-in-operation-in-germany.

63 Fraunhofer Institute for Solar Energy Systems (ISE). *Photovoltaics Report*. Freiburg: Fraunhofer ISE, May 29, 2025. https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/Photovoltaics-Report.pdf.

64 Burgen, Stephen. "'If 1.5m Germans Have Them There Must Be Something in It': How Balcony Solar Is Taking Off." *The Guardian*. December 18, 2024. https://www.theguardian.com/environment/2024/dec/18/if-a-million-germans-have-them-there-must-be-something-in-it-how-balcony-solar-is-taking-off.

65 2019: Priwatt blog (late 2020/early 2021): 600 W two-module kits €950–€1,250; used here as the earliest documented proxy for 2019. (*2019 proxy*) Priwatt, "Balkonkraftwerk: Kosten, Stromersparnis und Förderung," *Priwatt Blog*, December 2020 (updated January 2021), accessed September 24, 2025, https://priwatt.de/blog; (2020–2021) Hochschule für Technik und Wirtschaft Berlin (HTW Berlin), *Marktstudie Stecker-Solar-Geräte 2022* (Berlin: HTW Berlin, February 2022), https://solar.htw-berlin.de/studien/marktstudie-steckersolar-2022/; 2022: Business Insider citing Idealo/Verivox: Apr-2023 avg €712, 29% below Apr-2022 -> ~€1,003 in Apr-2022 (midpoint used. 2022) Business Insider Deutschland, "Balkonkraftwerke: Preise 2023 deutlich gefallen," *Business Insider*, April 26, 2023, https://www.businessinsider.de; 2023: heise/TechStage (Oct 11, 2023): two-panel ~800 Wp kits from ~€549 (promos) to ~€989. Heise Online / TechStage, "Balkonkraftwerk kaufen: Das müssen Sie beachten," *c't/Heise Online*, October 11, 2023, https://www.heise.de; DAC (Sept 2025, reflecting 2024–25 level): 800 W complete set around €300–€500. ADAC, "Balkonkraftwerk: Was Sie über Anschaffung und Nutzung wissen sollten," ADAC, September 18, 2025 (reflecting 2024–25 market level), https://www.adac.de; Finanztip (May 2025): 2-module ~900 W sets €480–€540. Finanztip, "Balkonkraftwerk: Lohnt sich das?," Finanztip, May 2025, https://www.finanztip.de/photovoltaik/balkon-solaranlage/.

66 SolarPower Europe. *EU Market Outlook for Solar Power 2024-2028*. December 17, 2024. https://www.solarpowereurope.org/insights/outlooks/eu-market-outlook-for-solar-power-2024-2028/detail.

67 Portable Sun LLC, *Hyperion 400W Bifacial Solar Panel (Black) | Up to 500W with Bifacial Gain*, accessed September 22, 2025, https://www.portable-sun.com/products/hyperion-400w-bifacial-solar-panel-black-up-to-500w-with-bifacial-gain?variant=48960818839827.

68 US Solar Supplier, "*APSystems DS3-117001 880W Microinverter*," accessed September 22, 2025, https://ussolarsupplier.com/products/apsystems-ds3-117001-880w-microinverter (Note: This price reflects the 240V version. A 120V version has already been announced and is expected to be priced comparably once mainstream adoption drives a more competitive market. The inverter cost is $192.85, plus $15 for the AC power cord).

69 Amazon.com, "*ECO-WORTHY 2 Sets 45inch Adjustable Solar Panel Tilt Mount Brackets with Foldable Tilt Legs*," accessed September 22, 2025, https://www.amazon.com/dp/B0CP3QVV6B?ref=ppx_yo2ov_dt_b_fed_asin_title.

70 U.S. Department of Energy (DOE), Solar Energy Technologies Office (SETO), *Solar Futures Study*, DOE/GO-102021-5621 (Washington, DC: U.S. Department of Energy, September 2021), https://www.energy.gov/sites/default/files/2021-09/Solar%20Futures%20Study.pdf.

71 U.S. Energy Information Administration (EIA). "EIA Data Show That by 2020, U.S. Households Had More Efficient Lighting, Larger TVs, and More Refrigerators." Press release. March 30, 2022. https://www.eia.gov/pressroom/releases/press499.php EIA 2022.

72 CLASP and Consumer Federation of America, *U.S. Consumer Attitudes Toward Appliance Efficiency Standards and Purchasing Behaviors by Income, Race, and Homeownership*, Issue Brief (Washington, DC: CLASP & Consumer Federation of America, October 2022), URL: https://www.clasp.ngo/research/all/us-consumer-attitudes-survey.

73 International Energy Agency, "Lighting," *Buildings, Energy System*, IEA, last updated July 11, 2023, retrieved September 4, 2025, from https://www.iea.org/energy-system/buildings/lighting.

74 Drew DeSilver, "As National Eviction Ban Expires, a Look at Who Rents and Who Owns in the U.S.," *Pew Research Center* (Short Reads), August 2, 2021, https://www.pewresearch.org/short-reads/2021/08/02/as-national-eviction-ban-expires-a-look-at-who-rents-and-who-owns-in-the-u-s/.

75 NREL, *Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation*, 2015.

76 U.S. Census Bureau, "2019-2023 ACS 5-Year Estimates."

77 Based on shingle roofs, which make up 75% of the market. Gitnux, *Roofing Industry Statistics: Market Data Report 2025*, and Nationwide, "When to Replace Your Roof," *Now from Nationwide* (blog), September 9, 2022, https://blog.nationwide.com/home/home-maintenance/when-to-replace-your-roof/.

78 CAPE Analytics, "The Challenge of Unlocking Accurate Roof Age Data," *CAPE Analytics Blog*, 2025, https://capeanalytics.com/blog/challenge-of-accurate-roof-age-data/.

79 Roofing Contractor, "New Report Says Many U.S. Homeowners Unsure of Roof's Health," *Roofing Contractor* (website), https://www.roofingcontractor.com/articles/99639-new-report-says-many-us-homeowners-unsure-of-roofs-health, and Gitnux, Roofing Industry Statistics: Market Data Report 2025.

80 The average cost to replace a roof in the United States in 2025 typically ranges from $7,000 to $14,500, with most homeowners spending around $11,000 for a standard 2,000-square-foot roof using common materials like asphalt shingles. *NerdWallet*, "Roof Replacement Cost in 2025," NerdWallet, https://www.nerdwallet.com/article/mortgages/roof-replacement-cost; Vazgen Dallakyan, "How Much Does a New Roof Cost in 2025? A Comprehensive Guide for Homeowners," *CobexCG Blog*, April 17, 2025, https://cobexcg.com/how-much-does-a-new-roof-cost-in-2025.

81 Rocket Mortgage, "67 % of Households Want Solar Panels," *Rocket Mortgage Learn*, November 8, 2022, https://www.rocketmortgage.com/learn/67-percent-of-households-want-solar-panels.

82 Based on residential installed cost per watt data from NREL 2023 Benchmark Cost, Energy Sage 2025, and SEIA/Wood Mackenzie US Solar Market Insight Q2 2025.

83 As of 2024, about 43% of residential solar installations are financed via loans. Total customer ownership (cash + loan) made up about 54% of the market; the remainder (~46%) are third-party owned systems (leases, PPAs). See Zoë Gaston, "U.S. Residential Solar Turbulence Persisted Through 2024," *Wood Mackenzie* (news / opinion), April 23, 2025, https://www.woodmac.com/news/opinion/us-residential-solar-turbulence-persisted-through-2024/.

84 Urban Institute, *Comparing Credit Profiles of American Renters and Owners*, by Wei Li and Laurie Goodman (Washington, DC: Urban Institute, March 2016), https://www.urban.org/sites/default/files/publication/78591/2000652-Comparing-Credit-Profiles-of-American-Renters-and-Owners.pdf.

Cover Image and Above: Adobe Stock

BRIGHT SAVER

About Bright Saver

Bright Saver is a nonprofit that empowers American households to generate their own clean energy from balconies, patios, and small spaces. By combining public education and affordable technology, their vision is to democratize solar in the U.S. and help everyday people save money while fighting climate change.

CONTACT US: INFO@BRIGHTSAVER.ORG | LEARN MORE: BRIGHTSAVER.ORG