History of the Residential Solar Industry in the United States

The residential solar industry in the United States has evolved from experimental curiosity to mainstream energy solution over five decades, shaped by technological breakthroughs, policy incentives, and changing economics. This transformation reflects a fundamental shift in how American homeowners generate and consume electricity.

Early Experimental Phase (1970s–2000)

The concept of solar-powered homes first materialized in 1973 when the University of Delaware constructed **Solar One**, the world's first photovoltaic-powered residence. This pioneering building integrated solar thermal and PV technologies, feeding surplus daytime power to the utility grid and purchasing electricity at night. The project demonstrated the technical feasibility of residential solar generation, though costs remained prohibitive for mass adoption.solarreviews+2

Federal policy support emerged in 1978 with the **Energy Tax Act**, which created the first federal tax credit for solar installations. Homeowners could claim 30% of the first $2,000 and 20% of the next $8,000 in installation costs for solar thermal systems. However, photovoltaic systems received limited attention, and the credit lacked the structure to drive significant market growth.solarreviews

Throughout the 1980s and 1990s, residential solar remained a niche market primarily serving off-grid applications. The technology's high cost and limited efficiency confined adoption to remote locations and environmentally committed early adopters. By 2000, the median residential system size was just 2.4 kilowatts, reflecting both technological limitations and economic barriers.insideclimatenews

Policy-Driven Market Creation (2005–2015)

The modern residential solar industry began with the **Energy Policy Act of 2005**, which established the **Investment Tax Credit (ITC)** at 30% for both residential and commercial solar systems. This legislation provided the financial foundation that would eventually make solar economically viable for mainstream homeowners. Initially capped at $2,000 for residential systems, the credit became significantly more powerful when Congress removed the cap in 2008.allenergysolar+2

California launched the **California Solar Initiative (CSI)** in 2006, a $3 billion, decade-long subsidy program that became the nation's most ambitious state-level solar incentive. The CSI

offered upfront rebates and performance-based incentives, successfully catalyzing market growth and establishing installation best practices that would spread nationwide. The program exceeded expectations before closing in 2016.solarreviews

Cost reductions during this period were dramatic. The average residential solar price fell from **$6.62 per watt in 2011 to $4.67 per watt in 2012**, reaching **$3.36 per watt by 2015**. These price declines resulted from manufacturing scale, improved installation practices, and increased competition. By 2015, more residential solar capacity had been installed in 18 months than in all previous years combined.solarreviews

Mainstream Adoption and Market Maturation (2016–2022)

The residential solar market achieved critical mass around 2016 when the **one-millionth solar array** was installed in the United States. This milestone marked solar's transition from alternative technology to established home improvement category. Market penetration accelerated as costs continued declining and financing options proliferated.allenergysolar

State policies increasingly supported adoption. In 2018, California became the first state to **mandate solar panels on new homes** built after January 1, 2020. The California Energy Commission estimated the mandate would add $8,000–$12,000 to construction costs while saving homeowners $80 monthly on energy bills. This policy signaled solar's evolution from optional upgrade to standard building component.bloomberg+1

The **Inflation Reduction Act of 2022** represented the most significant federal clean energy legislation in history, extending the 30% ITC through 2032 and removing the maximum credit cap. The law also introduced new manufacturing incentives and created the **Solar for All** program, which allocated $7 billion for low-income solar deployment. These provisions made solar accessible to broader demographic segments and solidified the industry's growth trajectory.visualizingenergy+2

Battery storage integration emerged as a key trend during this period. Systems paired with storage grew from near-zero in 2016 to **12.3% of residential installations by 2023**. This development addressed solar's intermittency challenge and enhanced the value proposition for homeowners seeking energy independence.insideclimatenews

Current Market Challenges and Policy Disruption (2023–2025)

The residential solar industry faces significant headwinds following the **One Big Beautiful Bill Act (OBBBA)**, signed July 4, 2025. The legislation terminates the Section 25D residential ITC after December 31, 2025, eliminating the 30% tax credit that had driven adoption for two decades. Commercial projects retain incentives through 2027, but homeowner-owned systems lose federal support entirely.woodmac+3

Market data reveals the policy impact. In 2024, residential PV installations declined year-over-year in **42 states and territories**, with California accounting for 48% of the national reduction. The five-year market outlook has been cut by 9%, with installers reporting significant disruption and softening consumer demand.carboncredits+1

Despite these challenges, the industry maintains momentum through several channels. Third-party owned systems (leases and power purchase agreements) remain eligible for commercial tax credits through 2027. Additionally, **27.4% of 2023 installations** used solar leasing, reversing a decade-long decline as consumers sought alternatives to direct ownership.solar+1

Cost Trends and Market Economics

Residential solar pricing has followed a volatile but generally downward trajectory. By the second half of 2024, median gross costs reached **$2.65 per watt** for standalone PV systems. However, prices vary significantly by state, ranging from **$3.40 per watt in Nevada to $5.20 per watt in Utah**. The national median price in 2023 was $4.20 per watt, substantially higher than Australia's sub-$1 per watt costs, reflecting U.S. soft cost challenges.nrel+1

System sizes have grown dramatically as costs declined. The median residential installation increased from **2.4 kilowatts in 2000 to 7.4 kilowatts in 2023**. Larger systems improve economies of scale and better position homeowners to offset increasing electricity consumption from electric vehicles and heat pumps.insideclimatenews

Future Outlook and Market Potential

Long-term prospects remain substantial despite near-term policy uncertainty. Wood Mackenzie projects the residential solar market will grow at **9% annually** under business-as-usual scenarios, reaching **13% penetration by 2030**. The total addressable market is enormous: by 2050, approximately **70 million suitable homes** could potentially install solar, representing **1,494 GW of capacity**—exceeding the current entire U.S. generation fleet of 1,300 GW.woodmac+1

Even under pessimistic scenarios assuming no post-2025 incentives, the market is expected to return to growth by 2028, adding at least **150 GW by 2050**. Key growth drivers include rising retail electricity rates, improving battery storage economics, state-level renewable mandates, and continued technological advances.carboncredits

State policy momentum continues independent of federal support. California's mandate created a template that **New Jersey, Massachusetts, and Washington, D.C.** are actively considering. These policies reflect growing recognition that distributed solar represents essential infrastructure for decarbonizing the residential sector.nytimes

Conclusion

The U.S. residential solar industry has progressed through distinct phases: experimental demonstration (1970s–2000), policy-driven market creation (2005–2015), mainstream adoption (2016–2022), and current policy recalibration (2023–2025). The 2025 ITC termination represents the most significant policy reversal in the industry's history, yet underlying fundamentals—declining costs, improving technology, and state-level support—suggest resilience.

With only **7.5% of suitable homes** currently solar-equipped, the market retains enormous untapped potential. The industry's ability to adapt business models, reduce soft costs, and leverage state policies will determine whether the 1,494 GW addressable market translates into transformative deployment or remains partially realized. The next decade will test whether residential solar can maintain its growth trajectory without the federal incentives that catalyzed its rise.[carboncredits](https://carboncredits.com/u-s-residential-solar-in-2025-market-slowdown-now-but-2050-forecast-is-massive/)

1. https://www.solarreviews.com/blog/the-history-of-solar-energy-timeline
2. https://en.wikipedia.org/wiki/Solar_power_in_the_United_States
3. https://www.energysage.com/about-clean-energy/solar/the-history-and-invention-of-solar-panel-technology/
4. https://www.solarreviews.com/blog/tax-credit-history-home-solar
5. https://insideclimatenews.org/news/05092024/inside-clean-energy-rooftop-solar-power-snapshot/
6. https://www.allenergysolar.com/resources/solar-energy-history-timeline/
7. https://www.greenlancer.com/post/solar-energy-tax-credit-2025
8. https://www.bloomberg.com/news/articles/2018-05-09/california-votes-to-require-rooftop-solar-power-on-new-homes
9. https://www.bbc.com/news/world-us-canada-44059865
10. https://visualizingenergy.org/watch-the-history-of-solar-power-in-the-united-states/
11. https://exactsolar.com/the-investment-tax-credit-itc-for-homeowners/
12. https://www.woodmac.com/news/opinion/the-us-residential-solar-total-addressable-market-will-exceed-the-current-us-generation-fleet/
13. https://solsmart.org/resource/the-federal-and-state-context-policies-affecting-solar-energy-development
14. https://www.solar.com/learn/trump-and-the-fate-of-the-30-solar-tax-credit/
15. https://carboncredits.com/u-s-residential-solar-in-2025-market-slowdown-now-but-2050-forecast-is-massive/
16. https://docs.nrel.gov/docs/fy25osti/95135.pdf
17. https://www.nytimes.com/2018/05/09/business/energy-environment/california-solar-power.html
18. https://www.csis.org/analysis/us-solar-industry-strategy
19. https://www.statista.com/topics/11670/us-residential-solar-photovoltaics/
20. https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/residential-solar-down-not-out

21. https://www.doi.gov/pressreleases/biden-harris-administration-delivers-historic-milestones-new-actions-clean-energy
22. https://www1.eere.energy.gov/solar/pdfs/solar_timeline.pdf
23. https://solarroyal.com/us-solar-market-growth-trends/
24. https://www.bigdogsolar.com/solar-school/a-timeline-history-of-solar
25. https://www.solar.com/learn/solar-panel-cost/
26. https://solartechonline.com/blog/the-state-of-solar-2025-report/
27. https://www.solar.com/learn/california-solar-mandate/
28. https://www.irs.gov/credits-deductions/residential-clean-energy-credit
29. https://www.hoover.org/research/californias-solar-power-madness