

Arizona Solar Development Analysis

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Arizona Solar Development **ANALYSIS**

The state of solar development in Arizona can be evaluated by key factors such as federal and local regulations, incentives, grid interconnection and integration. The current state of development activity in Arizona is growing considerably and can be seen in this analysis summarizing all facets of solar energy project development.

We will break down the various federal and state incentives available to solar energy developers in Arizona and how to access them.

LandGate provides key data to the top developers and financiers in the country. To learn more about access to this platform, or to talk about how to apply the information below to your business, book time with a member of our dedicated energy markets team.



Arizona Solar Energy ACTIVITY

Status	AZ Solar Farm Count	AZ Solar Farm Capacity (MWac)	AZ Solar Farm Generation (MWh)
Operating	0.2	F 207 20	100 701
Operating	93	5,297.20	102,791
Under Construction	3	300	170 952
	5	500	179,000
Planned	7	1,327	664,958 (est.)
Queued Projects	135	29,435	24,654,192 (est.)
Site Control (Lease Options)	18	7,923	2,569,975

*est is the estimated peak total electricity generation that those solar farms will produce once operational

Arizona currently has 93 active and operating utility-scale solar farms with a total capacity of 5.3 GW. Arizona also has an extensive pipeline for future development with 3 farms under construction, 7 planned farms,135 queued projects with a total capacity of over 29 GW, and 18 site control farms with a total capacity of 7.9 GW.

Overall, if all under construction, planned, queued, and site control farms go into operating status, Arizona will expand its capacity by nearly 13.6 GW! In Arizona, the average solar farm size is 262 acres, producing 57 MW of electricity under ideal conditions.



Solar farm count in Arizona



Solar farm capacity by farm status in Arizona

Overview: Past, Present & Future of Solar in Arizona

Arizona's energy market has long been dominated by natural gas, with natural gas-fired power plants providing a substantial 42% of the state's total in-state electricity net generation in 2022. While natural gas remains a significant player, the landscape is shifting rapidly towards renewable energy sources, particularly solar power. Arizona receives copious amounts of sunlight, ranking second in the nation in solar energy potential. The rise of solar energy is evident in the state's energy mix, with solar photovoltaic (PV) and solar thermal energy contributing almost three-fifths of the total renewable energy generation in 2024. This transition is not only reshaping the energy landscape but also aligning with Arizona's commitment to cleaner energy sources.

With its abundance of sunshine, Arizona has become a leader in solar power generation, ranking among the top five states in the nation in total solar-powered generating capacity. Arizona's renewable energy standard (RES), implemented in 2006, has also played a crucial role in driving solar development and diversifying the state's energy portfolio. The RES mandates that regulated electric utilities source a portion of their electricity from renewable resources, with solar power being a significant beneficiary. As the state approaches the RES target of sourcing 15% of electricity from renewables by 2025, utilities are making ambitious commitments to transition towards carbon-free energy sources. Major utilities in Arizona have announced plans to achieve 100% carbon-free energy by 2050, with intermediate targets highlighting the pivotal role of nuclear power and renewable resources, particularly solar and wind, in meeting these goals. These initiatives underscore Arizona's proactive stance in embracing renewable energy and transitioning towards a more sustainable future.

As of May 2024, Arizona stands out as a significant center for the advancement of solar energy. The state possesses more than 5.3 gigawatts (GW) of installed solar capacity, positioning it as the fifth-largest solar contributor nationwide. Bolstered by substantial investments totaling \$18.8 billion, Arizona's solar sector thrives, benefitting from notable cost reductions—solar prices have decreased by 47% over the past decade. Projections indicate ambitious growth, foreseeing an additional 9 GW to be added within the next five years. Solar energy in Arizona currently powers around 1,173,331 homes, constituting 10.15% of the state's electricity provision. Looking ahead, notable efforts are evident, exemplified by Arizona Public Service Company's plans to install 6 GW of new renewable capacity from 2025 to 2031, aimed at replacing retiring coal plants, underscoring a steadfast dedication to expanding renewable energy and solar infrastructure.





As seen in the graphic above, much of Arizona's net generation distributed via solar originated post-2014. While Arizona has a complex fuel mix contributing to the state's total net generation, utility-scale solar developments are on the rise and currently account for over 5% of the current generation. While this expansion is fairly recent, it's noteworthy that with an extensive future pipeline for utility scale and small-scale projects, Arizona is poised to become one of the pioneers of solar energy in the United States with the current projections estimating that the state will grow by 9 GW in the next 5 years, with the state currently investing over \$18 billion.

Utility-Scale

Utility-scale solar refers to solar farms often created and managed by utilities, independent power producers, or energy firms. These projects aim to produce electricity on a large scale and deliver it directly into the distribution grid. These solar farms generally have more than 10 MW in capacity. Below is a breakdown of the different types of solar farms and their development statuses.

Utility-Scale

The state of Arizona is not part of a particular RTO or ISO. However, The Arizona Corporation Commission (ACC) oversees the electric power industry in Arizona.

Projects Queued for Development in Arizona

Number of Solar Farms	135
Capacity (MWac)	29,435
Generation (MWh)	2,654,192

A project in queue means that the project enters the interconnection queue of that region waiting for regulatory approval. During this period, the analysis of possible engineering and land factors is conducted to determine the feasibility of the project to be constructed and connected to the grid. The average amount of time it takes for a farm to go from queue to operational in Arizona is \sim 3 years. As per the projected in-service dates for the current projects in queue, Arizona will most likely add ~ 7 GW of Utility Scale farms by the end of 2025.

How do developers screen and run due diligence for those solar farm projects in site control?

Factors to take into consideration:

- Electricity generation
- Electricity commodity prices (LMP, incentives, PPA)
- Capital costs
- Operating costs
- Timing
- Risks

Using the factors above and a standard solar panel size, the buildable acreage and a land coverage ratio (encompassing row spacing and maintenance spacing) we calculate the maximum number of panels that could fit on the parcel. This helps us estimate the capacity the project lease will add to the grid and calculates a Market Value of the solar project.

Solar PowerVal enables similar capabilities to evaluate land parcels for solar development and get an independent economic report for solar projects of all statuses. This tool allows developers and project financiers to fast-track the process of submitting a feasibility study to the queue for approval through independently produced Engineering & Economic analytics and Solar 8760 reports or evaluate projects and parcels for origination and M&A.

Major Utilities in Arizona: Deep Dive



Some of the more prominent utilities in the state of Arizona include the Arizona Public Service Company (APS), regulated by the Arizona Corporation Commission (ACC), Tucson Electric Power (TEP), and Salt River Project (SRP). These three largest utilities (TEP, APS, and SRP) represent over 80% of electricity production for the state of Arizona.



The number of utility scale solar projects being added in Arizona was on the rise up to 2021. With an extensive future pipeline of queued, planned, building and site control farms on the way, Arizona has become a large proponent of both utility scale and community solar farms in the United States. With a total capacity of over 13600 MW in just queued projects, Arizona is spearheading a state-wide shift in natural gas energy sources to solar projects in the coming years. The average project time in development in Arizona currently stands at roughly 3 years, which is on par with many of the other top states for solar in the United States.

The slight tapering of the number of solar projects added to the AZPS OASIS Queue, and the reason for the complex landscape surrounding solar power adoption in Arizona lies a multitude of factors that contribute to the dwindling number of solar projects being added to the interconnection queue. One prominent issue is the cost associated with solar power, despite recent reductions in prices. Even with subsidies, solar installations are depicted as having a high upfront cost, making them less appealing when compared to traditional energy sources like coal, natural gas, or nuclear power.

Moreover, the intermittent nature of solar energy poses significant challenges. The excerpt emphasizes the limitations of solar power generation during nighttime and cloudy days, as well as the lack of effective energy storage solutions. Without reliable methods for storing excess energy generated during peak sunlight hours, solar power remains unable to provide continuous electricity supply, necessitating reliance on alternative energy sources to fill in the gaps.

The reduction of subsidies and incentives for solar installations further impacts the growth of the solar industry. While subsidies have incentivized the adoption of rooftop solar systems, their decline in recent years has hindered further expansion. Additionally, the efficiency and scale of solar installations are highlighted, with residential rooftop systems being portrayed as less efficient compared to utility-scale solar plants. This suggests that directing investments towards larger projects could yield more solar power output for the same cost.

Furthermore, the indirect subsidies and cross-subsidies associated with rooftop solar installations raise concerns about equity and fairness in electricity pricing. The debate over whether solar customers should bear their fair share of infrastructure and utility costs adds complexity to the economic viability of solar power. These considerations contribute to a challenging landscape for solar power expansion in Arizona, where various economic, technological, and policy barriers must be addressed to facilitate sustainable growth in the solar industry.

Withdrawn Projects

The number of withdrawn projects per year have steadily decreased post-2012 in this same light as well. Arizona had implemented numerous state-wide initiatives that increased the accessibility to both community and utility scale solar projects, but this relationship also arises with the number of withdrawn projects. Many solar projects are withdrawn from the interconnection queue in Arizona due to various factors contributing to project delays and uncertainties. One significant reason is the complexity and length of the interconnection process itself, which often involves navigating regulatory requirements, obtaining permits, and securing agreements with utility companies. Additionally, changes in market conditions, such as fluctuations in financing availability or shifts in policy incentives, can impact the viability of projects and lead developers to reconsider their plans.



Highlights: Notable APS Solar Installations in Arizona



Project	Capacity	Description
Solana Generation Station	280 MW	 Operated by Arizona Solar One LLC Year of commercial operation: 2013 Enough electricity to meet the needs of approximately 70,000 homes and obviate the emission of roughly 475,000 tons of CO2 every year Subject to a 30-year PPA with APS
Foothills Solar Plant	35 MW	 Year of commercial operation: 2013 Project was developed by Amec Foster Wheeler and is currently owned by Arizona Public Service <u>Project</u> supplies enough clean energy to power 8,750 households.
Hyder Solar	22 MW	 Owned by Arizona Public Service Year of commercial operation: 2011 Developed by SunEdison <u>Project</u> supplies enough clean energy to power 4.250 households. Project consists of 69,000 modules

Highlights: Notable TEP Solar Installations in Arizona



Wilmot Energy Center	160 MW	 Owned by NextEra Energy Resources Year of commercial operation: 2021 314,000 solar panels that can track the movement of the sun for increased production
Fort Huachuca Solar PV Project	17.7 MW	 Owned by Tucson Electric Power (TEP) Year of commercial operation: 2014 Produces enough power to satisfy one-quarter of Fort Huachuca's energy needs, equivalent to the annual electric usage of about 3,000 homes Will offset approximately 58,000 tons of carbon dioxide per year
Picture Rocks Solar	20 MW	 Owned by MN8 Energy Year of commercial operation: 2013 Single-axis tracking system is located on a 305-acre site owned by Tucson Water just west of Tucson Panels are mounted on horizontal-axis trackers that rotate with the sun's position in order to optimize electricity production

Highlights: Notable SRP Solar Installations in Arizona



Project	Capacity	Description
Mesquite Solar 1	170 MW	 Owned by Con Edison Energy Year of commercial operation: 2011 Expected to generate 328,000 megawatt-hours of clean energy per year Expected to prevent 190,000 metric tons of carbon dioxide emissions annually
Sun Streams 2	150 MW	 Owned by Longroad Energy Year of commercial operation: 2020 Expected to generate over \$40 million for Arizona's schools via a long-term lease with the Arizona State Land Department Also expected to generate over \$5 million in tax revenue
Arlington Valley Solar Energy 2	129 MW	 Owned and operated by Arevon Energy Year of commercial operation: 2013 Was developed in 4 different phases

How is a Utility-Scale solar project submitted to the queue to connect to the electric grid?

Typically, the queue submission process within an ISO or Utility area follows similar steps.

The solar developer needs to complete and submit an official interconnection request form provided by the ISO or utility, that captures essential project details and starts the interconnection process. Project specifications should include details like name, location (latitude and longitude), point of interconnection, capacity, expected energy production, environmental impact, technology layout- inverters, solar panels, system layout through a Feasibility study with an 8760 report to help initially assess the project's compatibility with the existing grid infrastructure. The Solar developer will also have to pay an initial payment to secure a position in the interconnection queue and contribute towards the cost of initial studies and evaluations conducted by the ISO/Utility. Post the submission of the form, reports and payment, the project is now effectively in the queue.

After the project has entered the queue, Injection reliability study and system impact study is conducted. These studies determine the exact impact of the project on existing infrastructure and identifies any potential network updates required to reliably interconnect the solar project to the grid. Once the study is completed, the developer gets a complete picture of the financial cost of the solar farm with regards to the complete CAPEX and Budget. This helps the decision making process of whether to move forward with the development of the solar project or withdraw the application from the queue. If the project seems viable to move forward the developer signs an interconnection agreement with the ISO/Utility and essentially looks to produce Economic and Financial reports for Bankers and Investors to help facilitate the construction of the solar project.

How does a Utility-Scale project connect to the Electric Grid?



These projects are interconnected through transmission lines that carry electricity from one point to another in an electric power system grid. These lines are used to transmit electrical power from power generation sources to distribution centers, which are then distributed to end-users. Through LandGate's accessible transmission line data, developers and landowners can evaluate land parcels based on segments & feeders, proximity to existing distribution lines and distribution hosting capacity.

Commercial, Community, & Behind- the Meter **SOLAR FARMS**

The implementation of community solar in Arizona has faced significant hurdles despite efforts to establish a robust program. While the Arizona Corporation Commission initially aimed to create a leading community solar initiative, their adoption of a policy statement in March 2023 fell short of stakeholder expectations. Unlike the successful models seen in 20 states and the District of Columbia, Arizona's policy lacks crucial elements necessary for fostering community solar development. For instance, the compensation structure for community solar gardens in Arizona, set at the utility's avoided cost, fails to reflect the true value of distributed solar and introduces uncertainty with fluctuating rates. Additionally, the policy's optional participation for utilities, coupled with the requirement for community solar projects to compete in a request for proposals process, creates further barriers for developers and adds to the uncertainty surrounding the market.

Furthermore, Arizona's policy fails to adequately support low-income customer access, despite mandating a portion of subscription capacity for low- to moderate-income ratepayers. The lack of assistance for outreach and subscription management places an additional burden on developers. With utilities retaining the discretion to curtail purchased power from community solar gardens, the policy undermines investor confidence and fails to create a conducive environment for community solar investment. Consequently, while Arizona may have taken steps to address certain aspects of community solar, the policy's inherent flaws deter investment and hinder the potential for widespread adoption of community solar initiatives in the state.

As a consequence of the challenges facing community solar implementation in Arizona, the state has witnessed a surge in utility-scale solar farm developments. Faced with policy uncertainties and a lack of conducive regulations for community solar, developers and utilities have turned their attention towards large-scale solar projects. Arizona's abundant sunshine and vast land availability have made it an ideal location for utility-scale solar farms, which can provide significant renewable energy generation capacity. These projects, often exceeding hundreds of megawatts in capacity, are typically developed by utility companies or large energy corporations, taking advantage of economies of scale and streamlined regulatory processes for utility-scale installations. Consequently, while community solar initiatives have faced setbacks, Arizona's landscape is increasingly dotted with utility-scale solar farms.

Arizona LMP Data

LMP (Locational Marginal Price) a pricing mechanism used is wholesale/merchant in energy markets to determine the cost of electricity at specific locations (node) within the grid. LMP considers a number of variables, including the cost of generating power, transmission constraints, grid congestion, losses, and load at certain nodes or locations within the electrical grid. The prices at which electricity is bought and sold in the market in real time or on an hourly basis are reflected in its calculation, which is done through market procedures.

Arizona saw the average LMP price decrease by 36.5% in the past 3 years with an average price of \$54.61 \$/MWh in the year of 2024. This price is forecasted to decrease by 8% in 2025 to \$50.2. Similarly, consumer electricity purchase cost has also increased for the past few years in Arizona. The current commercial electricity rate is 11.56 ¢/kWh which is a 26.3% increase compared to the commercial electricity rate of 9.15 ¢/kWh in 2020.

In Arizona, higher Locational Marginal Prices (LMPs) within the energy market could present specific challenges for the state's electricity distribution system. Elevated LMPs may reflect congestion in certain areas of the grid, potentially indicating insufficient transmission infrastructure or imbalances in supply and demand. This congestion could lead to increased costs for consumers, as electricity providers may need to procure power from more expensive sources to meet demand. Additionally, high LMPs may impact the economic viability of renewable energy projects in the state, affecting Arizona's transition towards cleaner energy sources.

Arizona LMP Scorecard



Average LMP Prices: Historical & Forecasts

Year	Avg LMP Price (\$/MWh)
2019	\$25.22
2020	\$29.95
2021	\$44.83
2022	\$150.75
2023	\$91.96
2024 (est.)	\$54.61
2025 (est.)	\$50.21
2026 (est.)	\$51.21

Based on the LMP and ISOs data in Arizona, the 2024 average LMP is estimated to be \$54.61/MWh, decreasing by 40.6% compared to 2023.

Arizona **PPA Data**

Utility-scale solar can be integrated into the grid and electricity can be sold at a predetermined price thanks to PPAs (Power Purchase Agreements) with utilities or power purchasers. Even if they are unable to put solar panels on their own homes, PPAs for community-scale solar projects allow local participants to profit from solar energy generation. The time and amount of power sales are governed by the PPA's terms, which guarantees a steady market for the solar installation.

The average Estimated Utility-Scale PPA price in Arizona is \$95.11 \$/MWh. This demand influences PPA prices as developers strive to meet regulatory requirements while remaining profitable. Additionally, limited land availability poses challenges for large-scale renewable projects, increasing associated with costs land acquisition and development, thus impacting PPA prices.

In Arizona, Power Purchase Agreement (PPA) prices are influenced by a diverse array of factors. The state's energy mix, comprising coal, natural gas, nuclear, hydroelectric, and wind energy, along with the increasing competitiveness of renewable sources like wind power due to technological advancements, significantly impacts PPA rates. As Arizona's energy landscape evolves, with a growing emphasis on renewables and technological innovation, the dynamics driving PPA prices continue to evolve, reflecting the complexities of the state's energy market.

Furthermore, Arizona's low development costs have contributed to stable PPA prices. Advancements in solar technology have led to increased efficiency and lower manufacturing costs, making solar panels more affordable to install and maintain. These technological innovations have also improved the overall performance and reliability of solar systems, reducing operational expenses and enhancing long-term cost competitiveness.

Arizona PPA Scorecard



Average Utility-Scale PPA price 2023:	\$95.11/MWh
Average PPA price change in the last 3 years	+01.20%
Largest PPA buyers:	Amazon, Meta, Google

Average PPA Prices:

Year	Price (\$/MWh)
2022	\$94.82
2023	\$92.17
2024	\$95.11
2025	\$94.70

Federal & AZ State Tax Incentives for Solar Developers

There are several federal and state incentives available for solar development in Arizona, intended to encourage the use of solar energy by making solar power more affordable for businesses and organizations that install solar systems. These incentives can improve the financial viability of solar projects since they lower the initial costs and increase the return on investment. Solar project incentives aid in the switch to clean, renewable energy sources, which lower greenhouse gas emissions and slow climate change. Incentives aid in increasing the deployment of solar projects by making solar energy more financially appealing, replacing fossil fuel-based power and lowering the environmental effects related to traditional energy sources.

Solar Development Incentive	Туре	About
Net Billing	State	With net billing, consumers are allowed to get retail credit for the surplus electricity generated from local power systems that are sent back to the grid.
Federal Solar Tax Credit (ITC)	Federal	Developers can claim 30% of the installation cost as a credit on their federal income taxes.
Energy Equipment Sales tax Exemption	State	Arizona provides a property tax exemption for solar power systems and other energy-efficient upgrades, exempting homeowners from paying taxes on the increased value added by these installations. The exemption applies to various solar technologies, including solar panels, passive solar technology like Trombe walls, solar pool heaters, solar space heaters, solar thermal electric systems, and solar water heaters. This incentive remains in effect indefinitely after the installation of the energy equipment, offering continued tax relief to homeowners.
Solar Equipment Sales Tax Exemption	State	In Arizona, eligible solar equipment enjoys a 100% exemption from sales tax as an incentive. This exemption is a one-time benefit provided by the Department of Revenue and covers solar energy devices and their installation when done by approved contractors. However, it's important to note that this exemption doesn't extend to accessories like solar battery storage or other supplementary items not directly part of the initial solar power system.

Additional Incentive	Туре	About
Mohave Electric Cooperative Sun- Watts Renewable Energy Incen- tive Program	State	Mohave Electric Cooperative offers its customers incentives to install solar photovoltaic systems through the SunWatts program. Customers can receive a rebate of \$0.05 per watt, up to a maximum of \$2,500 for their solar installations. Additionally, for solar water heating systems, customers can benefit from a payout of \$0.75 per kWh of energy saved during the first year of operation. The rebate for solar installations is a one-time offer, while the payout for solar water heaters extends throughout the initial year of system operation.
Trico Electric Cooperative SunWatts Incentive Program	State	Trico Electric Cooperative provides incentives to its customers who use solar water heaters through the SunWatts rebate program. Customers can receive a payout of \$0.40 per kWh saved during the first year of operation for their solar water heaters. This rebate program is designed to encourage the adoption of solar water heating systems, with the payout continuing throughout the initial year of system operation.
Sulphur Springs Valley EC-SunWatts Rebate Program	State	Sulphur Springs Valley Electric Cooperative offers a SunWatts rebate program for its customers who install solar water heaters. Customers can receive a rebate of \$0.50 for every kWh of expected first- year energy savings generated by their solar water heaters. This incentive program aims to promote the adoption of solar water heating systems among Sulphur Springs Valley EC customers, with the payout extending throughout the first year of the system's operation.

Renewable Portfolio Standard (RPS) Goal:

In November 2006, the Arizona Corporation Commission (ACC) set in motion a significant expansion of the state's Renewable Energy Standard (RES), aiming to escalate renewable energy consumption to 15% by 2025. Additionally, it mandated that 30% of this renewable energy must be sourced from distributed energy technologies. The legal clearance for these rules came in June 2007 when the state attorney general certified their constitutionality, and they promptly took effect. This regulatory framework targeted investor-owned utilities and electric cooperatives serving retail customers within Arizona, with exceptions made for distribution companies primarily serving customers outside the state.

Under these regulations, utilities obligated to the RES must acquire renewable energy credits (RECs) from eligible renewable resources to fulfill 15% of their retail electric load by 2025 and beyond. A notable provision is the requirement that 30% of this energy, equating to 4.5% of total retail sales by 2025, must originate from distributed renewable (DR) resources. The compliance schedule delineated the gradual increase in renewable energy adoption, with a particular emphasis on DR resources, starting from 2006 and extending through 2025. Alongside this, utilities had the flexibility to utilize bundled RECs acquired in any year to meet their annual requirements.

Moreover, the regulations outlined mechanisms for earning extra credit multipliers through early technology installation, in-state solar initiatives, and in-state manufacturing content. However, these multipliers had limitations to prevent excessive exploitation. For instance, RECs derived from renewables installed after December 31, 2005, were ineligible for multipliers. Utilities subject to the RES were mandated to submit compliance and implementation plans annually to the ACC, with costs recovered through a monthly surcharge. This surcharge, though customizable by each utility, required ACC approval to ensure alignment with the regulations. Additionally, utilities had the option to file rate cases with the ACC instead of adhering strictly to the tariff framework.



Renewable Energy Standard (RES) Compliance Schedule



With such a wealth of new data on the state of Solar Development in Arizona, we imagine you might have questions about how to apply these trends, data, and tools to your own solar development efforts in Arizona. Our dedicated energy markets team can help walk you through how to access and interpret this information in a way that is relevant to your business needs. Schedule time with our team here to talk one on one.



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