How Smart Permitting Could Accelerate Rooftop Solar in Arizona

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Executive Summary

Every year, tens of thousands of Arizona families pursue energy independence by generating electricity through their own solar photovoltaic systems. They are turning Arizona's sunny weather into lower bills and increased resilience.

But all too often, families' attempts to generate their own solar electricity are held back by unnecessarily complex government bureaucracy. Families that install solar frequently need to receive a permit from local governments to begin installation. In Arizona, permitting can be a lengthy, costly, and inconsistent process, which can discourage and prohibit families from investing in solar in the first place.

> As smart permitting cuts through red tape, families going solar could save $1,300–$1,400 on the cost of a new system by 2030, and $3,100–$3,200 by 2040.

This report traces how the current solar permitting process deters families from "going solar," and how streamlining this process using a standardized, online, and smart permitting software platform would help bring solar to more roofs in more neighborhoods. Five jurisdictions in Arizona have already launched smart permitting (Pima County, Phoenix, Tucson, Cottonwood, and Oro Valley) and a sixth has begun piloting it (Goodyear).

> "[H]aving this additional tool is exciting for us, because we don't want to slow down our residents who want to install solar. It also frees up our staff to do more oversight and focus more on the very complex projects."
> –Kate Gallegos, Mayor of Phoenix[1]

This report models the potential impacts of adopting such a platform across Arizona, and projects that smart permitting could eventually lead to significant savings for Arizona families. Making the process of getting solar projects approved more efficiently would bring down the costs associated with the permitting process. As these costs get passed on to consumers, lower prices could spur increased demand.[2] As smart permitting cuts through red tape, families going solar could save $1,300–$1,400 on the cost of a new system by 2030, and $3,100–$3,200 by 2040.[3] And that is only the beginning of the savings.

Over the lifetime of the panels, the typical family that "goes solar" as a result of smart permitting could save $61,000 in reduced electricity bills.[4] As electricity prices increase over time, the average family could save $1,500–$2,700 in electricity bills each year. Adding up the projected ratepayer savings over each system's expected lifetime, the additional families installing solar by 2030 as a result of smart permitting could eventually save a combined $1.7–$1.8 billion. By 2040, the expected lifetime ratepayer savings of the additional systems could rise to a combined $15–$18 billion. These projections assume only gradual increases in electricity prices over time: if utilities move forward with substantial rate increases then the value of generating power at home could increase even further.[5]

As smart permitting cuts through the red tape and reduces unnecessary bureaucratic costs, more families will be able to go solar. This could spur the installation of an additional 20,000 home solar systems in Arizona by 2030 and 249,000–299,000 by 2040, an increase of 51–54% above business-as-usual.[6] These additional rooftop systems could add a combined generating capacity of 240–260 megawatts by 2030 and 2.2–2.6 gigawatts by 2040. In other words, a shift to smart permitting could add more generating capacity than two nuclear power plants.[7]

The increase in demand for new solar installations could also create 440–470 jobs across the state by 2030, and 1,000 jobs by 2040. Higher installation volumes could also increase permitting fee revenue for jurisdictions, bringing in $26–$36 million by 2040. The simplification of the solar permitting process could also free up resources at building departments. Reduced labor required to review solar permits could save 230,000-235,000 hours of building department staff time by 2030 and 909,000–991,000 hours by 2040. This would allow building department plan reviewers to focus on more pressing priorities, like permitting new housing starts. Arizona's severe housing shortage and skyrocketing prices makes freeing up building department time all the more important.[8]

Up until recently, governments that wanted to implement smart permitting had no choice but to implement it themselves. This could be a costly and complicated task for an individual government to start from scratch, requiring specialist expertise and resources. But the recent launch of multiple smart permitting platforms available at no cost to governments mean that the status quo of slow, manual permitting processes is no longer difficult to escape. For families and the state to realize the benefits described in this report, Arizona should ensure that smart solar permitting is widely available.

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Credits
Alexander Gard-Murray is a Fellow of the Greenhouse Institute and a Research Affiliate of the Climate Solutions Lab.

The Greenhouse Institute is an independent network of researchers finding and fighting for solutions to the climate crisis.

The Climate Solutions Lab is housed at the Watson Institute of International and Public Affairs at Brown University, dedicated to creating, learning, and distributing solution-oriented climate knowledge, at Brown and across the world.

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Cover Image
Image of Sombrero Peak, Arizona by Frankie Lopez, available at https://unsplash.com/photos/green-leafed-plants-during-daytime-t3wdraaj72Q.

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The Benefits of Residential Solar in Arizona

Residential solar benefits the grid by reducing the need for costly transmission and distribution upgrades, alleviating stress on the infrastructure, making the overall service more dependable.[9,10] In addition to the everyday benefits achieved by reducing the total demand for electricity, rooftop solar helps reduce strain on the grid during hot afternoons.[11] When paired with a home battery, residential solar can provide clean energy to the residence and neighborhood once the sun sets.

Solar electricity makes vital contributions to Arizona's economy. The state has the tenth highest electricity prices in the continental United States, but solar PV systems can allow residents to cut their bills by $1,500–$2,700 annually.[12] The solar industry, including residential, commercial, and utility scale companies, employs 10,110 people in the state across more than 379 businesses.[13] Altogether, solar investments in Arizona to date total more than $21.3 billion.[14] But despite the development to date and benefits of residential solar, deployment in Arizona remains far below its potential.

Policy Recommendations

Given the expected benefits, all families in Arizona should have the opportunity to install rooftop solar with a permit obtained via an instant process. State policymakers should consider encouraging or requiring permitting authorities to pursue smart permitting. Hundreds of cities have implemented or are implementing programs to support instant review, and Texas is considering it as well. Five jurisdictions in Arizona have already launched smart permitting (Pima County, Phoenix, Tucson, Cottonwood, and Oro Valley) and a sixth has begun piloting it (Goodyear). The sooner the rest of Arizona follows their lead, the sooner the benefits will start to accrue.

There are also other bureaucratic barriers to solar adoption, particularly around building inspections. Though these are beyond the scope of this report, finding ways to lower these barriers while maintaining installation quality and grid balance would also likely speed up solar installation and bring down solar prices. Arizona leaders, jurisdictions, and utilities should look for ways to minimize unnecessary delays and costs here as well.

Modeling Results

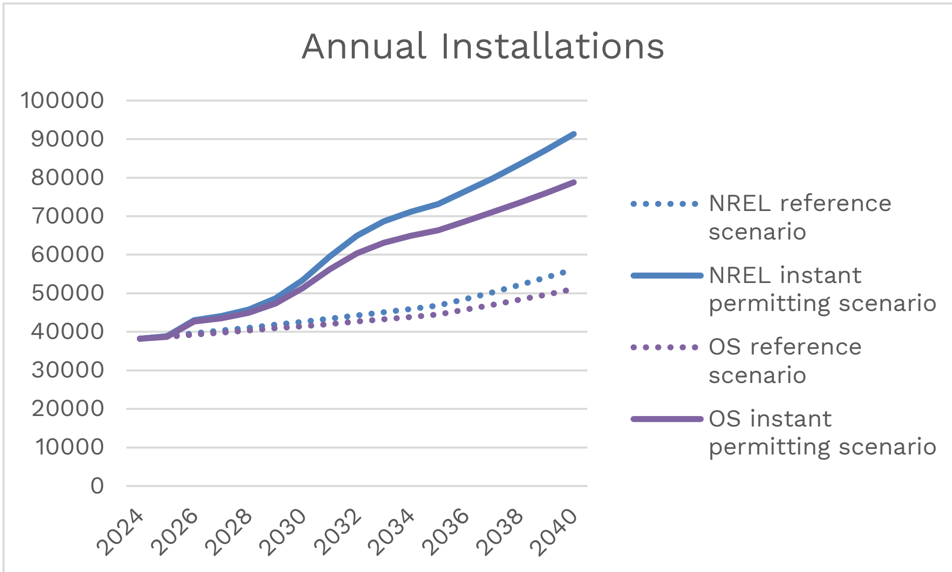
To estimate the impact of smart online permitting in Arizona, this report models how automation could change the costs faced by installers, lower the prices paid by consumers, reduce cancellations, improve the purchasing experience for families, raise the financial appeal of rooftop solar, and increase the number of solar systems installed. It then projects impacts on individual households and on the state as a whole. The full details of the methodology are available in the Technical Appendix.[15]

The model assumes an 8.6kW system with 22 panels (close to the median size of a system in Arizona). To make sure we capture the different environments in the state, the model run is repeated for Arizona's different climate zones. In each climate zone, the population center of the most populous county in the zone is used as the reference point. The utility rates are also taken from that county, and correspond to the most current rates available. The model takes into account the hourly weather and electricity consumption for a typical home in each reference county. The cost modeling is done in Excel and Python, and the performance modeling is done using NREL's System Advisor Model.[16]

The model uses two benchmarks to track the cost of installing residential solar systems. The first is grounded in data from the National Renewable Energy Laboratory and the second is grounded in data shared by a major solar installer software platform, OpenSolar.[17] These data are combined to produce a range of estimates. In both cases, the prices are modified from their original national estimates to reflect local prices in Arizona.[18]

The model assumes that the market environment in which residential solar has developed to this point will persist. Significant changes to the market, such as the expansion of the Successor Solar Incentive program or cuts to net metering, could change outcomes either positively or negatively. The model also assumes that cost reductions for installers will gradually be passed on to consumers as the market adjusts, and that these cost reductions will drive increased consumer demand. While the model is grounded in real cost data, it is important to note that individual project cost components can vary significantly between companies and markets.

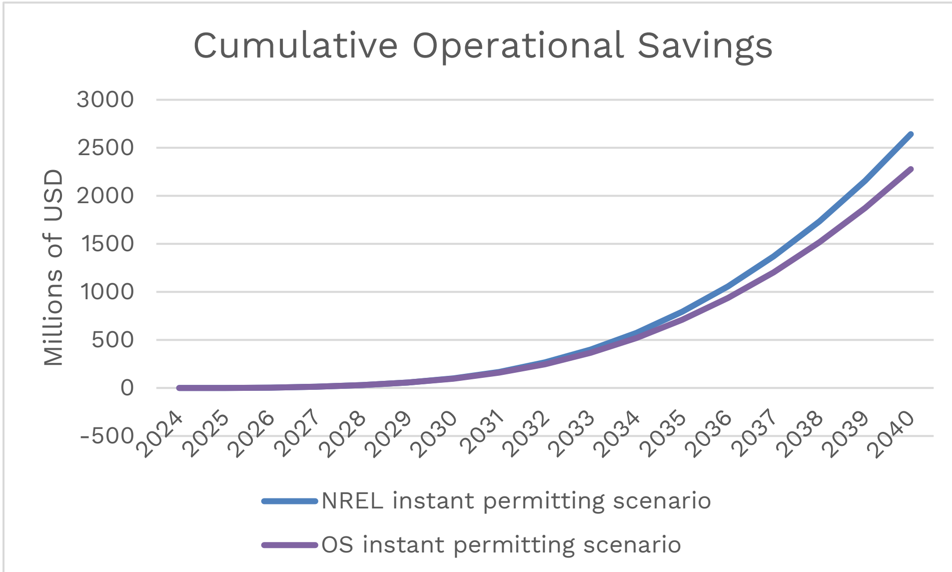
The results suggest that if Arizona rolled out smart permitting statewide beginning in 2026, it could have major impacts on solar deployment. By 2030, an additional 28,000–30,000 families could go solar compared with a business-as-usual scenario. As contractors reconfigure operations to take full advantage of the simplifications and efficiencies of smart permitting, the model projects installations could take off even faster. By 2040, the model suggests that Arizona could have 249,000–299,000 more residential rooftop solar systems than we would currently expect. This is a 38%–43% increase over business-as-usual installations. It is equivalent to more than two gigawatts of additional generating capacity, twice as much as a typical nuclear reactor. In other words, Arizona families would add more generating capacity than two nuclear power plants—without building any new nuclear power plants.[19]



All these additional solar systems could produce major savings for families. As smart permitting cuts through red tape, families buying a new system could save $1,300–$1,400 on the cost of a new system by 2030, and $3,100–$3,200 by 2040. These savings are independent of state or federal incentives and financing arrangements that can further reduce the price of a new system.

Savings could continue to accumulate over the lifetime of the system, as solar generation can reduce electricity bills significantly. New solar systems last 30 years without significant performance drops, and can continue to operate longer (though parts of the system may need to be replaced).[20] But even if the model assumes that systems are replaced entirely after 30 years, the savings over that time dwarf the upfront costs of the system. The model suggests that a typical 8.6kW system could cut the average family's annual electricity bills by $1,500–$2,700 depending on the location of the system and the year of operation. This is equivalent to a (rounded) monthly bill reduction of $124–$226. Over a 30-year system lifetime, these savings could amount to $61,000, much larger than the typical cost of a system.

Across all the additional families installing solar, the savings could be quite significant. The 28,000–30,000 additional systems installed by 2030 could produce $41–$43 million in savings that year. By 2040, the potential 249,000–$299,000 additional systems could produce annual savings of $405–$484 million. Adding together all the savings over the modeled 30-year lifetime, the additional systems installed by 2040 because of smart permitting could produce a combined $15–$18 billion worth of savings for Arizona families.



By replacing electricity that households would otherwise buy from the grid, and generating excess electricity that can be sold to other households, these additional solar installations could also significantly reduce emissions in the Grand Canyon state without adding any government bureaucracy, cumbersome taxes, or new spending allocations. An average family installing solar could cut emissions by 4.2 metric tons of CO_2e per year in 2030 and 3.1 tons in 2040.[21] That's the equivalent of avoiding the emissions from burning 342–472 gallons of gasoline or 3,400–4,700 pounds of coal. It would take 3–4 acres of U.S. forests a year to sequester the same amount of emissions.[22]

Looking across all the additional systems, by 2030 Arizona families could collectively avoid 117,000–124,000 metric tons of CO_2e emissions each year compared to business as usual. That's equivalent to taking 28,000–29,000 gasoline-powered cars off the road. By 2040, annual emissions savings could expand to 756,000–907,000 metric tons of CO_2e. It would take 759,000-910,000 acres of U.S. forests a year to sequester the same amount of carbon. Families would need to divert 64–77 million trash bags of waste from landfills to recycling every year to achieve the same emissions reduction.

Looking again at the modeled 30-year system lifetime, the additional systems installed by 2040 because of smart permitting could eventually save 14–17 million metric tons of CO_2e. That's the equivalent of shutting 4 coal-fired power plants for a year. To achieve the same emissions reductions through cutting fuel usage, the state would need to reduce consumption by 11-13 million barrels of oil, 560–649 million gallons of gasoline, or 5.5–6.4 billion pounds of coal. It would take a forest more than four times the size of the Grand Canyon a year to sequester the equivalent amount of carbon dioxide.[23]

Jurisdictions could see benefits at building departments as well. Smart residential solar permitting could save 909,000–991,000 hours of staff time at building departments through 2040, allowing plan reviewers to focus on other priorities, such as permitting new housing.[24] Additionally, the increased volume of solar installations could mean more revenue in the form of permitting fees. The model suggests that fee revenue through 2040 could increase by a cumulative $26–$36 million dollars, even if local governments covered the fees for the smart permitting platforms.

All these additional panels could also increase the number of jobs in solar installation in Arizona. Even though smart permitting would reduce the total labor hours needed to install solar panels on an individual house, the increase in overall demand is projected to more than make up for more efficient project timelines. The model suggests that Arizona could have more than 440–470 additional residential solar installation jobs by 2030, and 1,000 more residential solar jobs by 2040, an increase of 37%–38% above current residential solar employment.

Data from the EIA suggests that batteries paired with residential solar systems are relatively uncommon in Arizona, with 2.7% of solar systems paired with home batteries. As costs for batteries fall or if energy tariffs are reformed, this figure could well increase. Were Arizona families to install home batteries at the same rate as California families, then the increased demand for solar as a result of smart permitting could deliver between 0.19–0.20 GWh of new battery capacity by 2030 and 1.7–2.1 GWh by 2040.[25] This could insulate families from energy tariff changes, as well as make Arizona families more resilient to power outages and natural disasters.[26]

Acronyms

CO_2e	CO_2-equivalents
$mTCO_2e$	Metric Tons of CO_2-equivalents
$MMTCO_2e$	Million Metric Tons of CO_2-equivalents

W	Watt	1 W
kW	Kilowatt	1000 W
kWh	Kilowatt-hour	1000 Wh
MW	Megawatt	1,000,000 W
MWh	Megawatt-hour	1,000,000 Wh
GW	Gigawatt	1,000,000,000 W
GWh	Gigawatt-hour	1,000,000,000 Wh

Endnotes

[1] SolarAPP+ (2023). "What are local governments saying about SolarAPP+?" https://help.solar-app.org/article/225-testimonials.

[2] The projected cost reductions are derived from assumptions based on samples of the market. The components of a project's cost, which impact the projected cost savings achieved from smart permitting, can vary widely across the industry.

[3] Unless stated otherwise, the projections here are based on the analysis described more fully in the report.

[4] This assumes a 30 year lifetime with 0.5% annual loss in panel capacity (DOE 2021). This calculation is separate from the upfront cost, which for a 7.5 kW system in Arizona is roughly $30,000, based on the Arizona price of $4/W in Barbose, G., Darghouth, N., O'Shaughnessy, E., & Forrester, S. (2024). *Tracking the Sun: Pricing and Design Trends for Distributed Photovoltaic Systems in the United States, 2024 Edition*. National Renewable Energy Laboratory. https://emp.lbl.gov/sites/default/files/2024-08/Tracking%20the%20Sun%202024_Report_0.pdf.

[5] Our ratepayer savings calculations assume that rates increase gradually in real terms.

[6] The model assumes that the market environment in which residential solar has developed to this point persists. Significant changes to the market, such as the expansion of the Successor Solar Incentive program or cuts to net metering, could expand or shrink the projections.

[7] Office of Nuclear Energy (2021). "How Much Power Does A Nuclear Reactor Produce?" Department of Energy. https://www.energy.gov/ne/articles/infographic-how-much-power-does-nuclear-reactor-produce.

[8] Faller, M.B. (2024). "New ASU report addresses affordable housing crisis in Arizona." *ASU News*. https://news.asu.edu/20240822-local-national-and-global-affairs-new-asu-report-addresses-affordable-housing-crisis.

[9] Fields, S. (2023). "How solar benefits the electricity grid." EnergySage. https://www.energysage.com/electricity/how-solar-helps-the-grid/.

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[11] Fields, S. (2023). "How solar benefits the electricity grid." EnergySage. https://www.energysage.com/electricity/how-solar-helps-the-grid/.

[12] Price data from EIA (2024). "Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector, by State, July 2024 and 2023." *Electric Power Monthly*. Energy Information Administration. https://www.eia.gov/electricity/monthly/epm_table_grapher.php. Savings calculated using NREL (2024a). *System Advisor Model Version 2024.12.12*. National Renewable Energy Laboratory. https://https://sam.nrel.gov.

[13] IREC (2024). Arizona: Solar and Clean Energy Jobs. Interstate Renewable Energy Council. https://irecusa.org/arizona-solar-and-clean-energy-jobs/. SEIA (2024). “Arizona State Solar Overview.” Solar Energy Industries Association. https://seia.org/state-solar-policy/arizona-solar/.

[14] SEIA (2024). “Arizona State Solar Overview.” Solar Energy Industries Association. https://seia.org/state-solar-policy/arizona-solar/.

[15] The Technical Appendix is available at http://www.greenhouse.institute/research/2025/solar_permitting_az/.

[16] NREL (2024a). *System Advisor Model Version 2024.12.12*. National Renewable Energy Laboratory. https://https://sam.nrel.gov.

[17] Ramasamy, V., Zuboy, J., O’Shaughnessy, E., Feldman, D., Desai, J., Woodhouse, M., Basore, P., & Margolis, R. (2022). *U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022* (NREL/TP-7A40-83586). National Renewable Energy Laboratory. https://www.nrel.gov/docs/fy22osti/83586.pdf. OpenSolar data were provided directly to the author.

[18] Prices are adjusted from national values to Arizona values using BEA (2024). "SARPP Regional price parities by state." U.S. Bureau of Economic Analysis. https://www.bea.gov/tools.

[19] Office of Nuclear Energy (2021). “How Much Power Does A Nuclear Reactor Produce?” Department of Energy. https://www.energy.gov/ne/articles/infographic-how-much-power-does-nuclear-reactor-produce.

[20] This is a conservative assumption since new systems often produce power for 30-35 years or more. See DOE (2021). “End-of-Life Management for Solar Photovoltaics.” Department of Energy Solar Energy Technologies Office. https://www.energy.gov/eere/solar/end-life-management-solar-photovoltaics.

[21] The size of the avoided emissions is lower in 2040 because the grid is assumed to be getting cleaner over that time, which reduces the emissions impact of residential solar. The Cambium model we use to calculate avoided emissions reflects state policies to enforce cleaner grids through mechanisms like renewable portfolio standards. See Gagnon, P., Sanchez Perez, P.A., Obika, K., Schwarz, M., Morris, J., Gu, J., & Eisenman, J. (2024). “Cambium 2023 Scenario Descriptions and Documentation. National Renewable Energy Laboratory. NREL/TP-6A40-88507. https://www.nrel.gov/docs/fy24osti/88507.pdf.

[22] These emissions comparisons and those that follow are calculated using the EPA Greenhouse Gas Equivalencies Calculator. See EPA (2024). Greenhouse Gas Equivalencies Calculator. Environmental Protection Agency. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

[23] The forest required would be 5.0–5.8 million acres, and the Grand Canyon has an area of 1.2 million acres.

[24] Cook, J., Akar, S., Chang, D., Fensch, A., Nissen, K., O'Shaughnessy, E., & Xu, K. (2024). *SolarAPP+ Performance Review (2023 Data)*. National Renewable Energy Laboratory. NREL/TP-6A20-89618. https://www.nrel.gov/docs/fy24osti/89618.pdf.
[25] For uptake rates in California see Palmere, M. (2024). "Behind-The-Meter Distributed Generation Forecast Updates." California Energy Commission. https://www.energy.ca.gov/sites/default/files/2024-12/Behind-The-Meter_Distributed_Generation_Forecast_Updates_ada.pdf.
[26] Battery uptake is likely linked to the prices utilities pay for solar exported to the grid by families. While it is beyond the scope of this paper, if utilities were to reduce the rates they pay for such exports then batteries could help limit the financial impact of that change.