

A No-Cost Rooftop Solar Stimulus

How streamlining residential solar installations can jumpstart a green economic recovery

Acknowledgements

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Introduction

As California looks to exit the pandemic, the need for a green recovery through the expansion of rooftop solar energy generation and energy storage has never been clearer. This expansion would help address climate change by meeting the state's renewable energy targets, protect communities from wildfires and public safety power shutoffs, and grow local jobs and small businesses in every California community. This brief lays out a set of quick, no-cost actions that state and local governments can take to begin this expansion and updates SPUR's 2020 policy brief with new data and a renewed urgency.

Cities and counties have an opportunity to tackle the long-standing barrier to solar and storage adoption: the "soft costs" associated with permitting and inspection. These processes are intended to protect residents and promote safety, but they can complicate and delay solar installations, particularly for routine, small-scale residential solar and storage systems. In effect, local and state governments should treat installing rooftop solar panels more like getting an appliance such as a new HVAC system or washing machine and less like a construction process, such as a seismic retrofit of a home. By bringing down these "soft costs" while still guaranteeing safety, California and the Bay Area can address economic recovery, resilience and climate change goals at once.

The Golden Solar State

California has established a world-leading energy policy and regulatory approach to reducing climate emissions and transitioning to a fossil-free economy. In particular, Assembly Bill 32 (2006) established the goal of reducing statewide greenhouse gas emissions from all sectors of the economy to 1990 levels by 2020. Senate Bill 32 (2016) expands that requirement to 40% below 1990 levels by 2030. California's renewable portfolio standard, first established in 2002, requires the state to deliver 50% renewable electricity by 2030 and now, Senate Bill 100 (2018) has expanded the standard to 100% renewable by 2045. But despite the state's past success, emissions reductions must accelerate in order to meet the targets by the end of this decade. The California Air Resources Board, California Public Utilities Commission and California Energy Commission estimate the state will need to triple the rate of solar energy generation, including rooftop installations, in order to achieve 100% renewable energy.¹

Residential solar and storage is an important part of the state's clean energy transition and low-carbon future. California's sunny weather brings abundant solar energy to most parts of the state year-round. For customers, installing rooftop solar panels reduces their electricity bills, and for utility companies, decreases the need for costly grid upgrades, like new transformer stations, to meet increased energy demand. In 2018, the state cancelled or revised \$2.6 billion worth of grid transmission projects, savings attributed primarily to increased rooftop solar installations.²

Rooftop solar brings critical resilience benefits as well. In 2020, the three largest energy utilities conducted 21 public safety power shutoffs due to record wildfires, slightly less than all such shutoffs in the prior six years

¹ California Energy Commission, SB 100 Joint Agency Report, 2021, <https://www.energy.ca.gov/sb100>

² California Independent System Operator, "2017-2018 Transmission Plan," https://static1.squarespace.com/static/54c1a3f9e4b04884b35cfe6/t/5ab933322b6a28bbf5c5f130/1522086756653/CAISO-2017-2018_Transmission_Plan.pdf

combined.³ One of those shutoffs, from Sept 7-10, shut down power for 172,000 customers across 22 counties.⁴ These interventions will undoubtedly continue as the climate warms and utilities look to better manage risk: A recent court ruling could result in triple the number of power shutoffs in counties across PG&E's territory in 2021. Rooftop solar, particularly when paired with a battery, can keep the lights on as well as medical devices running through these shutoff emergencies.

Prior to the COVID-19 pandemic, California was well-positioned to accelerate adoption of rooftop solar. The 2019 state building code update requires solar systems on new home construction, a regulatory change that builds upon other policies like net-metering, where customers are reimbursed for the electricity their panels generate and send back to the grid, and other incentives for customers to install rooftop solar and storage. National residential solar installations increased 11% in 2020 over the previous year, continuing a steady upward trend in demand since 2016.⁵ The solar industry was also widely considered a driver of green economic growth, adding more than 150,000 jobs across the United States in the last decade and growing at five times the rate of the overall economy.⁶ In 2018, the Federal Bureau of Labor Statistics predicted that solar installers in particular would be the fastest growing job over the coming decade.⁷ California already employed more than 74,000 solar workers, the majority of whom were installers. These are high potential jobs: median hourly wages for solar industry jobs overall are about 28% higher than the national median wage and are more likely to come with health care and retirement benefits than jobs across the rest of the private sector.⁸

Delivering Rooftop Solar Today

Installing rooftop solar is about twice as expensive in the United States as it is in a country like Germany, despite similar wages and equipment costs.⁹ What's behind these differences? As the cost of technology have declined over time, the "soft costs" account for a significant share of the total price of a solar system.¹⁰ For a customer, the soft costs specifically associated with solar installation, including costs for permitting and inspection can amount to as much as \$1 per watt of the installation, or \$5,000 for a typical rooftop system in California.¹¹ The biggest culprit behind high soft costs is usually time: despite the state's well-established rooftop solar industry, and some legislative reforms, described below, average wait times between when a permit has been submitted and completion of a successful building inspection have remained consistent at 45 to 50 days over the last decade.¹²

³ See <https://www.cpuc.ca.gov/psps/> and <https://www.cpuc.ca.gov/general.aspx?id=6442467662>

⁴ Pacific Gas and Electric Company, 2020, "compliance report letter on proactive de-energization," https://www.pge.com/pge_global/common/pdfs/safety/emergency-preparedness/natural-disaster/wildfires/PSPS-Report-Letter-09.07.20.pdf

⁵ Solar Energy Industry Association, 2021, "2020 Market Insight Report" <https://www.seia.org/research-resources/solar-market-insight-report-2020-year-review>

⁶ 2019 Solar Jobs Census, The Solar Foundation, <https://www.thesolarfoundation.org/national/>

⁷ 2019-2029 Employment Projections, Bureau of Labor Statistics, <https://www.bls.gov/news.release/ecopro.nr0.htm>

⁸ Clean Jobs, Better Jobs, E2/Acore/CELL; <https://e2.org/wp-content/uploads/2020/10/Clean-Jobs-Better-Jobs-October-2020-E2-ACORE-CELL.pdf>

⁹ Andrew Birch, 2018, "How to Halve the Cost of Residential Solar in the US," <https://www.greentechmedia.com/articles/read/how-to-halve-the-cost-of-residential-solar-in-the-us>

¹⁰ SEIA/Wood Mackenzie Power & Renewables, 2021, "Solar Market Insight Report: 2020 Year in Review," 2020, <https://www.seia.org/research-resources/solar-market-insight-report-2020-year-review>

¹¹ Soft costs vary based on factors like local sales tax, jurisdictions' permitting systems and installer cost structures. The National Renewable Energy Laboratory models cost benchmarks on a quarterly basis. The upper limit reflects this benchmarking and includes the additional indirect soft costs like customer acquisition. See <https://www.nrel.gov/docs/fy21osti/77324.pdf> and <https://www.seia.org/initiatives/solar-automated-permit-processing-solarapp>. Energy Sage provides average installation pricing based on location and system size.

¹² O'Shaughnessy, Barbose and Wiser, 2020, "Patience is a virtue: A data-driven analysis of rooftop solar PV permitting timelines in the United States," <https://emp.lbl.gov/>

Behind High Soft Costs: Permitting and Inspection Challenges

Each rooftop solar system requires a building permit, similar to what's required to build a new foundation for a home, as well as physical inspection before it can be connected to the grid and begin operating. The local permitting authority (usually a building department) takes a substantial fee (up to \$450) to review applications to ensure the system meets building code requirements. The process delay behind high soft costs for solar and storage systems is driven in large part by the patchwork of unstandardized and uncoordinated requirements and processes across California's 500+ cities and counties. The base building code is set by the State of California, but individual cities and counties interpret the same building code sections differently, and some impose their own additional unique code requirements. For example, one jurisdiction reviews solar plus storage systems on single-family homes according to the fire code, while the rest of the state uses the residential code. Another jurisdiction requires a minimum of three or four batteries installed per solar system — far more storage capacity than a typical home needs — based on interpretation that the battery in a solar plus storage system must be able to supply energy loads for every device and appliance in the home operating at the same time. Even within jurisdictions, different building code officials have developed different and unwritten interpretations of building codes, leading to uncertainty among installers and significant proportions of applications need to undergo corrections. Permit application submission itself varies greatly, where some building departments manage online databases but others require in-person and paper applications. Some jurisdictions may be able to provide an online portal and a clear and seamless experience while others struggle to manage outdated systems.

After a rooftop solar system is permitted and installed, it must be physically inspected to ensure code compliance, such as proper wiring methods, structural integrity of the building and fire safety measures. Some cities conduct multiple inspections over the course of construction and, in some cases, additional agencies like the fire district will conduct separate checks. As with the permitting process, there is significant variability in department expertise or interpretation of building codes between jurisdictions. The lack of a standardized and shared set of requirements for inspection causes confusion between inspectors and installers, and results in avoidable mistakes — on top of the logistical challenge of scheduling waiting for inspections.

Ultimately, the variability in code interpretation, permit submission, inspection delays and other factors has significant impacts for installers, customers and ultimately the state's ability to achieve its climate targets. The Solar Energy Industry Association reports that a one-week delay as a result of permitting, inspection and interconnection processes results in a customer cancellation rate between 5-10%. This drives down customer satisfaction, and increases the cost for installers to secure each additional new customer. It also increases the cost of managing crews and inventory across a regional market where requirements and installation timelines vary. The accumulated cost over the next 10 years is significant: assuming rooftop solar installations triple in California, we risk imposing up to \$7.5 billion in unnecessary soft costs in our effort to meet the state's clean energy targets.¹³

With more than 1 million rooftop solar installations in California and most sharing similar characteristics, the state can evolve permitting and inspection to reflect accumulated knowledge and best practices, and to allow for the scale of adoption needed to meet the state's clean energy targets.

¹³ Based on the estimate that permitting and inspection-related soft costs can total up to \$1 dollar per watt of installation. California installed roughly 1,000 MW of residential rooftop solar in 2019. See: <https://www.seia.org/state-solar-policy/california-solar>

Permitting for a Rooftop Solar Stimulus

Customers, advocates and research organizations — including SPUR — have long called for changes to the permitting and inspection process for rooftop solar systems.¹⁴ And there has been some incremental success.

Past Permitting Reforms

SB 1222 (Leno, 2012) and AB1414 (Friedman, 2017) capped permit fees based on the size of the system. AB 2188 (Muratsuchi, 2014) required local governments to create a streamlined permitting process for small (under 10 kilowatt) rooftop solar systems according to the state's the Solar Permitting Guidebook, which establishes best practices in solar permitting, such as a model streamlining ordinance and standardized inspection checklists. As a result, local jurisdictions must allow applications to be filed online for rooftop solar systems, limit permit review timeframes and consolidate inspection visits. However, many jurisdictions still do not fully comply more than seven years later, most often because permit review time frames still vary significantly from project to project.¹⁵ Other requirements are partially implemented; for example a jurisdiction will allow for a permit application to be submitted online, but applicants must show up at the Building Department and stand in line to receive the permit itself. While some jurisdictions may make a good faith effort to comply, AB 2188 included no mechanism to enforce compliance. At the same time, growing demand for solar means that these permit applications dominate the permitting queue in some jurisdictions, while others have already begun to anticipate increased workload as California transitions its building stock to all-electric in the coming years.¹⁶

Permitting for a Rooftop Solar Decade

What Could Solar Permitting Improvements Deliver for California?



3 TIMES

the solar installations to meet
California's clean energy targets



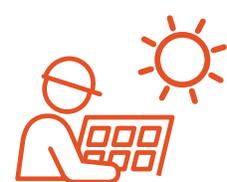
\$7.5 BILLION

in soft cost savings



\$111 MILLION

in increased annual permit fee
revenue for cities and counties



780,000 JOBS

in the solar industry

¹⁴ SPUR calls for streamlined permitting for solar systems in Fossil Free Bay Area (2016).

¹⁵ Taylor et al. found that as of 2019, 31% of jurisdictions did not comply with AB 2188, indicated by having adopted a local streamlining ordinance with the four parameters outlined in the original law. Anecdotal reports, however, suggest that compliance may be even more uneven within jurisdictions between projects, in part because the timeline requirements are not consistently met. See: Taylor et al., "Explaining jurisdictional compliance with California's top-down streamlined solar permitting law (AB 2188)," 2019, https://eta-publications.lbl.gov/sites/default/files/ab2188-streamlined_solar_permitting_reform_10-7_-_margaret_taylor.pdf

¹⁶ TRC Consulting, "Best Practices Guide for Streamlining Electrification Permitting," May 2021, Publication forthcoming.

There's a clear opportunity to evolve the permitting and inspection process in California that allows for more efficient use of staff time, reduces confusion and still ensure safety. "Instant permitting" shows particular promise: Cities including Los Angeles, San José, and Santa Barbara have all implemented an online portal that returns instant permits for rooftop solar systems with success (see sidebar). As part of its COVID-19 response, San Luis Obispo recently moved to both fully online and instant residential solar permitting. The city has reduced some projects' total installation time (from sale to permit approval to successful building inspection) to just 12 hours.

Reducing a months-long process down to an hour or less would accelerate the number of solar systems installed, consistent with what's needed to hit the state's clean energy goals. In fact, the National Renewable Energy Laboratory has found that jurisdictions with online and automated permitting (where an applicant can receive a permit immediately after submitting plans, answering a series of questions and paying their fee) approve an average of 14 times the number of applications as jurisdictions with a traditional over-the-counter process.¹⁷

Increasing the rate at which Californians install solar would bring a number of associated benefits. For a jurisdiction that typically approves 1,800 rooftop solar permits a year with a permit fee of \$300, tripling the number of approvals could increase their fee revenue to \$1.5 million or more. Statewide, tripling the number of residential solar installations along with the permit fees, could bring an additional \$111 million a year to local governments in California.¹⁸

For customers, the benefits extend beyond the \$3 billion in avoided soft cost described above. Recent research estimates that electrifying homes with rooftop solar could save the average American household as much as \$2,500 a year.¹⁹ Ratepayers could save billions in avoided grid upgrades. And the state could leverage a major opportunity for job growth: past research suggests that tripling rooftop solar installations could create 780,000 jobs over the next ten years.²⁰ The vast majority of solar companies are local, small businesses with under 100 employees, and these jobs pay well with few barriers to entry.²¹

17 Based on the National Renewable Energy Laboratory Solar TRACE tool, 2021. Dataset forthcoming: <https://solarapp.nrel.gov/solarTRACE>

18 Estimates based CA historical residential solar installations and median permit fee (\$350 per project). See National Renewable Energy Laboratory Solar TRACE tool, 2021. Dataset forthcoming: <https://solarapp.nrel.gov/solarTRACE>

19 Rewiring America, "No Place Like Home: Fighting climate change and saving money by electrifying American households," 2020, https://static1.squarespace.com/static/5e540e7fb9d1816038da0314/t/5f9290062226271c5b66b7d0/1603440672253/Households+Technical_White_Paper.pdf

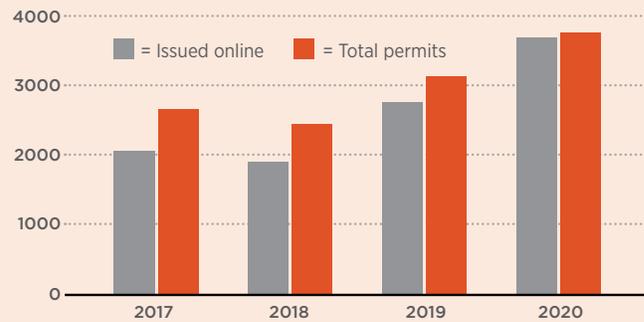
20 Estimate of 26 jobs per every 1 MW installed solar, based on research from NREL's JEDI model. See <https://rmi.org/how-covid-19-is-pushing-cities-to-change-solar-permitting-for-the-better/>

21 Brookings Institution, "How clean energy jobs and power an equitable COVID-19 recovery," 2020, <https://www.brookings.edu/blog/the-avenue/2020/09/10/how-clean-energy-jobs-can-power-an-equitable-covid-19-recovery/>. See also: <https://www.thesolarfoundation.org/national/>

Going instant and online in San José

In 2015, San José implemented a system that allowed for online permit submission for solar systems, but also provided instant approvals. Applicants receive a \$40 discount for submitting online, and are able to schedule an inspection through the portal as well. As a result, San José saw a more than 600% increase in residential rooftop solar permits in the following year (In contrast, the growth of residential solar systems across California was 3.3% that same year)²². While the city has maintained its over-the-counter option, recent data show that in addition to solar permits increasing, the percent of applicants choosing to process online has also increased. In 2020, 98% of solar permit issuances occurred through the city's online and instant portal. San José added battery storage to the instant permit system in August of last year.

Solar Permits Issued 2017–2020



San Jose permit issuances continue to increase after implementing an online, automated permitting process, and use of the that system has grown over time. Today, the vast majority of solar permits in the city are issues through the automated system. Source: San Jose Building Department permit issuances. Available upon request.

Policies to Support Streamlined Rooftop Solar Permitting and Inspection

Local governments across the California should pursue several significant steps to dramatically reduce the cost of small residential solar installations — and increase their uptake and associated economic benefits. The state should also require all local governments to adopt these best practices within the next few years, to speed expansion.

- 1 Improve upon AB 2188 and drive local compliance.** Research shows that fully online permit processes, as opposed to a hybrid of in-person and online options, are what make a meaningful impact on application timelines. The state could improve on AB 2188 by requiring that jurisdictions accept online permit applications (current law only requires that they provide for online submission and electronic signatures). Implementation of prior permit streamlining law has been uneven across jurisdictions. The state should provide incentives in the form of grants and technical assistance to drive more consistent compliance. The

²² Based on interconnection data for the state's Distributed Generation Statistics for California's investor-owned utility territory (Pacific Gas & Electric, Southern California Edison and San Diego Gas & Electric. <https://www.californiadgstats.ca.gov/charts/nem>

state should also hold jurisdictions accountable for non-compliance, either through legal action or making new grant funding contingent on AB 2188 compliance.

- 2 Standardize local building codes and inspections requirements for rooftop solar across the Bay Area.** A household appliance like a washing machine would be significantly more expensive if manufacturers had to produce enough models to comply with thousands of different cities' code requirements — the same argument can be made for rooftop solar and storage systems. Local jurisdictions should only modify state building codes with regard to solar and storage to address specific local risks (like snow loads, wind loads and temperature), and should do so in a standardized way. A standard set of requirements for rooftop solar and storage would go a long way toward reducing delay and uncertainty in the inspection process.
- 3 Provide automated and instant approval for online applications.** By creating online applications that ask standardized questions and filter for compliant answers, software can easily provide automated and instant approval for solar permits. This software would virtually eliminate the permitting cost born by local jurisdictions and cut permit application processing time to zero for most small residential systems. A number of California jurisdictions have created their own instant systems, but at significant expense. However, the National Renewable Energy Laboratory (a division of the federal Department of Energy) has created an online portal, SolarAPP, that is open-source and free for jurisdictions to adopt. This portal is a significant opportunity to reduce permit timelines, relieving building department workloads and standardizing processes across the state (see sidebar).
- 4 Reduce or eliminate permit fees for rooftop solar systems.** Permitting fees are used to subsidize the administrative cost of processing new solar projects. Ultimately, if jurisdictions improve their permitting and inspection processes with automated and instant online permitting, these fees could be reduced or eliminated for the vast majority of rooftop solar installations — which would increase access to solar panels for more would-be customers.
- 5 Explore offering virtual building inspections.** Virtual inspections would allow building inspectors to inspect many more worksites a day and better manage workloads, while reducing the delay associated with scheduling a building inspection visit and the amount of time that contractors must wait on site for the building inspector to arrive. Los Angeles has provided virtual building inspections since 2019. The pandemic prompted a number of cities to allow their building inspectors to perform virtual home visits and safety organizations like International Code Council, National Fire Protection Association and International Association of Electrical Inspectors have offered guidance. Cities and counties should consult best practices, engage with stakeholders including those organizations who represent building inspection officials, and explore this option for residential systems.

AB 2188 has demonstrated that a few jurisdictions adopting best practices is not enough; cities and counties across California should implement these ideas in order to drive more widespread adoption and meet the state's clean energy targets. What's more, widespread implementation reduces barriers to solar for more people and more communities, while allowing contractors to better plan for a customer market that spans political boundaries.

SolarAPP: The new national standard

Until recently, jurisdictions like San José had to build custom software solutions to address permitting challenges for rooftop solar. Over the past year, however, the National Renewable Energy Laboratory has partnered with solar companies and code enforcement officials to create the Solar Automated Permit Processing platform (SolarAPP), an online and automatic solar permitting software that local jurisdictions across the United States can use for free. SolarAPP was developed with national building code and safety agencies like the International Code Council, Underwriters Laboratories and the National Fire Safety Association. The platform is built according to the national electrical code, though it also allows for local customization options around snow, fire and earthquake safety requirements.

Like with a credit card application, SolarAPP asks a set of standardized questions and only accepts applications with compliant answers. SolarAPP then provides an instant assessment of the system's compliance with state building codes and instantaneously approves or identifies the noncompliant answers. Importantly for local governments, it can be used on its own or integrated with online permitting management software that some jurisdictions already use, and allows local jurisdictions to collect permit fees within it.

Finally, SolarAPP also produces a standardized building inspection checklist that can integrate with any inspection process, including virtual inspections. The platform is in use in jurisdictions around the country, and has issued more than 100 automatic solar permits since its rollout in January 2021. About 50 jurisdictions in California are in various stages of exploring or implementing SolarAPP, including the city of Pleasant Hill. Going forward, NREL will expand the software to include compliance checks for batteries and electric vehicle charging.

Beyond Rooftop Solar: Streamlining Electrical Vehicle Charging and Building Decarbonization

In some ways, rooftop solar is just the beginning of a major transition for California's built environment. Today, buildings account for 25% of the state's carbon emissions; in the coming decade, more of California's building stock will transition to low- or no-carbon, and hundreds of thousands of electric vehicle charging stations will need to be installed. In fact, Governor Newsom signed an executive order²³ setting a target that 100% of in-state sales of new passenger vehicles will be zero-emission by 2035. Getting to 100% EV sales hinges on rapidly building out charging infrastructure, an effort that will accelerate job growth and economic recovery. Yet the delays and costs for permitting electric vehicle charging stations are even more significant than those for rooftop solar and storage.²⁴ This issue also extends to the replacement of gas-fired appliances with clean electrical ones (like electric heat pumps), as the replacement often needs to be done within a day or two when an appliance breaks, leaving no time for lengthy permitting and building inspections. By successfully streamlining our solar and storage permitting, and working through challenges that arise, cities will provide the roadmap for what we need to do for electric vehicle charging, building decarbonization permitting and beyond.

23 Rocky Mountain Institute, 2019, "Reducing EV Charging Infrastructure Costs," <https://rmi.org/insight/reducing-ev-charging-infrastructure-costs/>

24 Rocky Mountain Institute, 2019, "Reducing EV Charging Infrastructure Costs," <https://rmi.org/insight/reducing-ev-charging-infrastructure-costs/>

Conclusion

As cities and counties emerge from the COVID-19 pandemic, they face both the newfound need for job and small-business creation as well as the continued threats of wildfires and climate change. Expanding rooftop solar and storage can spur local economic development, increase energy resilience and move the state closer to its emissions targets. But success will require a permitting process that is simple and automatic for homeowners, installers and regulators.



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