

Residential Solar Consumer Insights

Energy Resilience, Advertising, Policy Incentives, and Financing



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Executive Summary

SolarReviews.com and UC Berkeley's BEACN consulting group surveyed over 400,000 homeowners who requested a solar quote on a SolarReviews website between 2016 and 2020. This is one of the largest surveys of homeowners considering solar to date, covering questions about financing choice, storage, and key drivers or barriers that influenced homeowners' decisions. The results of this survey are examined in five case studies that highlight interesting developments in residential solar. Each case study has greater potential to be explored and provide novel insights. These case studies include findings in storage and energy resilience, the effects of homeowner awareness of financial incentives on solar adoption, and other areas. Further analysis into the case study findings and survey results could support innovation in state and federal solar policy, marketing techniques, and improved installer-to-consumer communication.

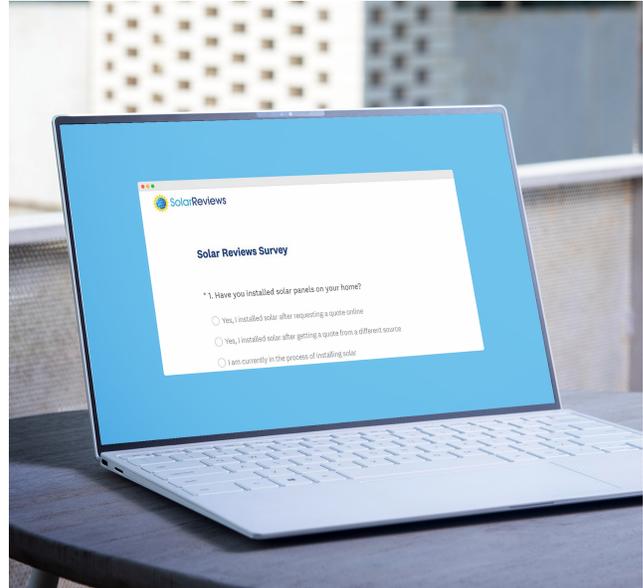
Survey Methodology

Survey introduction

To better understand what factors motivate people to go solar and what factors turn people away, 400,000 homeowners who had submitted a request for a quote from a SolarReviews service between 2016 and 2020 were surveyed. This survey identified which interested individuals installed solar with the intent to uncover useful trends in residential solar adoption.

Given the target population of these 400,000 homeowners, 384 completed surveys were needed for a 95% confidence interval. The total number of responses received for this survey was over 5,300 — which well exceeded the 384 needed responses for robust results.

The goal of this survey was to identify factors that affect the adoption of residential solar. This includes bottlenecks in the installation process, customer perceptions of the process, and customer knowledge of financial and non-financial benefits, as well as other factors.



Survey representativeness and bias

Because the survey was only sent to homeowners who interacted with SolarReviews, it is implied that respondents were interested in installing solar panels at one point. Thus, this survey is representative of nationwide homeowners who have had some degree of interest in solar installation. In addition, those who were previously interested in solar but did not install were less likely to respond to the survey due to their lack of engagement with the solar industry.

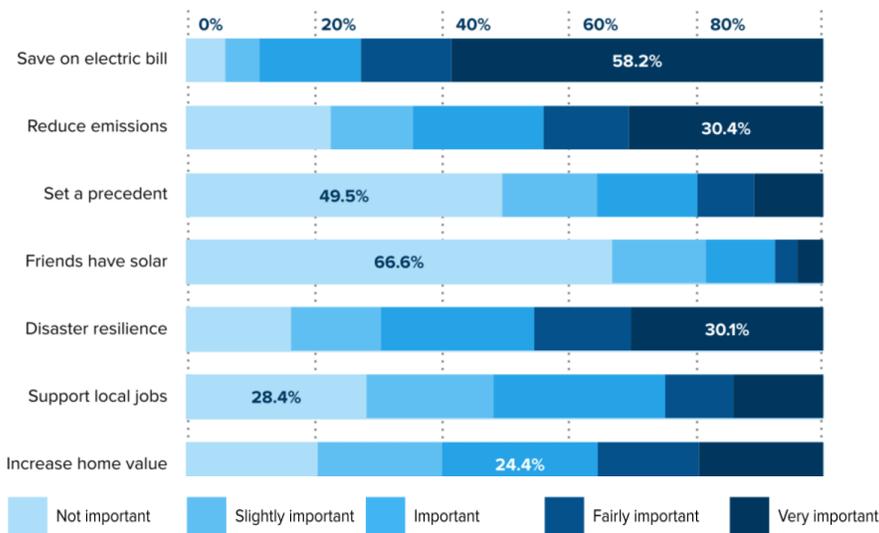
Survey Results

By the numbers

The results below are based on responses from:



Respondents Rating of Factors in Decision to Install Solar



How important were the following factors in your decision to install or consider solar?

According to the survey, the primary motivation for installing solar was potential savings on electricity bills.

Interestingly, the second and third most important drivers were disaster resilience and reduced emissions.

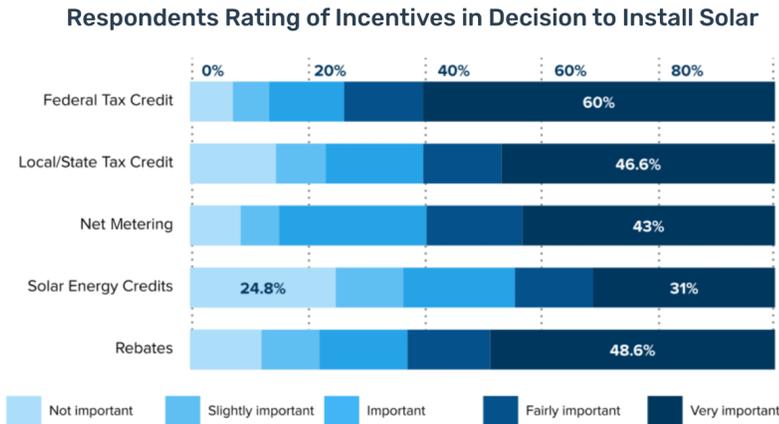
This implies that solar has the potential to tap into markets that experience power outages due to natural disasters, heat waves, or unreliable utility service.

Increased home value was rated as “Important” or higher by 59.8% of respondents, showing that consumers are considering the additional equity that an owned solar system can add to the home.

Another unique find was that support for local jobs was important for 52.4% of respondents.

How important were the following financial incentives in your decision to install solar?

The federal tax credit was the single-most important financial incentive to respondents.

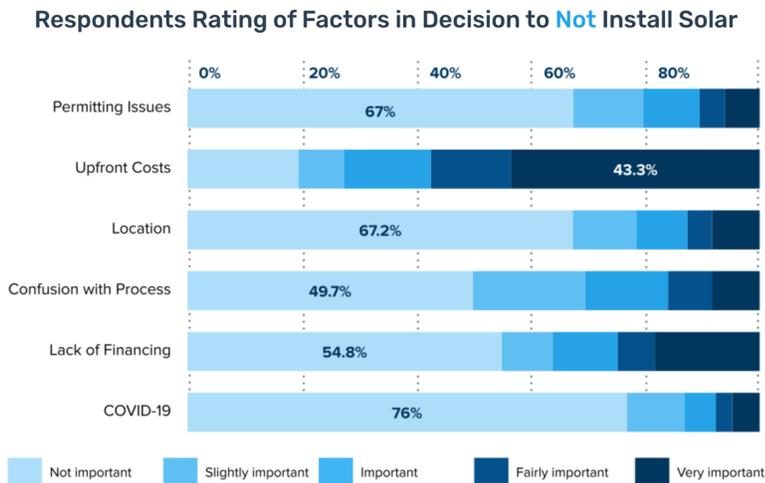


Net metering was the second-most important overall with 84.6% of respondents rating it with a score of “Important” or higher. Rebates and state/local tax credits were the second and third most salient options in terms of “Very Important” ratings.

The least popular, though still important incentive was Solar Renewable Energy Credits (SRECs). Only available in a few states, SRECs are certificates sold by homeowners to utilities based on the extra energy their solar panels produce.

Please rate how each of these factors played into your overall decision to not install solar

The data clearly shows that the upfront cost of solar is the most significant barrier to installing solar, with 72.5% of respondents rating it with a score of “Important” or higher.



Lack of financing came in second place, and although less striking than upfront cost, it was considered a significant barrier by 36.1% of respondents.

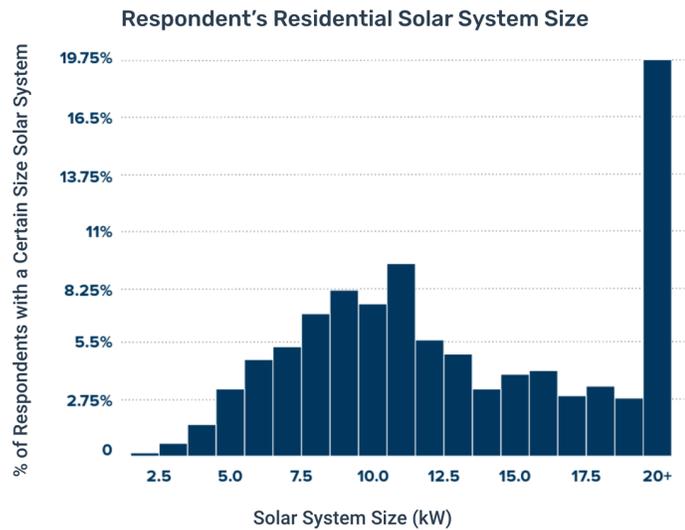
Interestingly, respondents rated confusion with the process of installing solar as more of an issue than permitting and location, ranking it as the third-most significant factor influencing their decision not to go solar.

Permitting and location concerns can be significant, but are mainly issues in areas where the permitting process hasn’t been streamlined, and for homeowners with shaded homes or other location-specific issues. This relatively high rating for process confusion implies that giving potential customers a clearer understanding of the process early on, along with information and resources that streamline the process, can increase the odds of them following through with their intent of installing solar.

What is the size of your solar system in kW?

The median solar system size of those surveyed was around 11 kW of capacity.

There were, however, a significant number of systems with over 20 kW of capacity; from our findings, it appears that residential system size follows a right-skew distribution.



Have you installed a battery storage system?

Responses to The Question: "Have You Installed a Solar Battery System?"



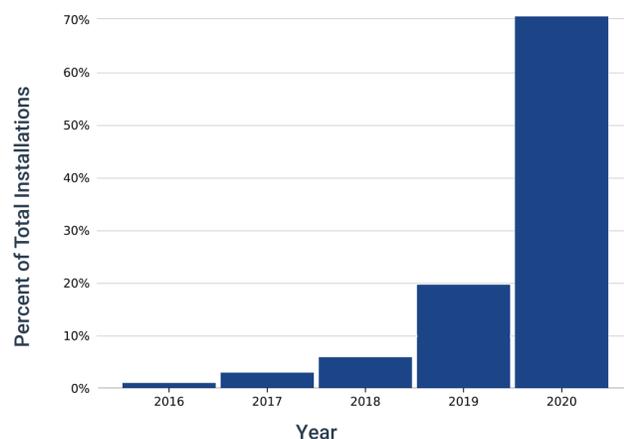
Of the respondents that have solar, 11.5% also have a battery storage system installed. Of that percentage, 88.7% installed their storage system less than 6 months before or after installing solar.

This shows that if a homeowner is considering installing solar with storage, they'll most likely purchase each within a short period of one another to reap the immediate benefits that financial savings and energy independence offer.

Since 2016, there has been clear year-over-year growth in battery storage installations for homeowners who install solar.

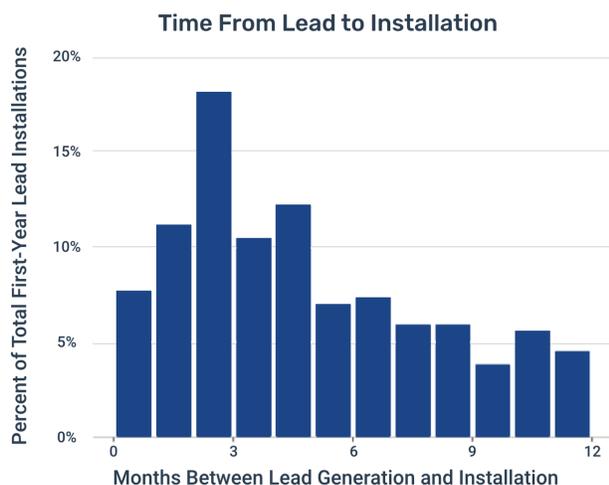
In fact, around 71% of installations over the last five years took place in 2020. This trend is likely to continue, due to interest in solar for disaster resilience which can be enhanced by the use of a battery.

Percent of Total Battery Installations from 2016-2020 by Year



Case Study: Timeline from Lead to Installation

Three months is the most common lead to installation timeline



This chart displays the distribution of the time between requesting a solar quote and installing a photovoltaic system within the first year. There is a clear peak at three months, followed by a gradual decrease in installations throughout the rest of the year. From the data, we determined that **37% of first-year installations occurred within three months of the original quote.**

But that does not mean homeowners should be forgotten if they have not installed within 3 months because **33% of first-year installations occurred more than six months after receiving an original quote.**

FIGURE 1: A histogram of the time between lead creation and installation for consumers who installed a system within one year of requesting a quote (excluding leads generated within a year of the survey)

Pre-2018 leads show that solar searchers remain interested in installation long term

Within Figure 2 below, the distribution over several years between requesting a solar quote and installing a photovoltaic system is displayed. Because of the long installation window, this chart is limited to respondents who first requested a quote prior to 2018.

Contrary to the pattern of gradually declining installations in the one year case, these respondents installed more systems during the 2+ years after receiving their initial quote versus within the original year. This may be partly driven by the reduction in the cost of solar installations during that time or by the rapid growth in the overall solar market.

It is clear that the interest in going solar among those who have sought out quotes does remain strong for years after the original quote was received. For instance, **68% of all survey respondents who have not yet installed solar and were not in the process of doing so, indicated that they were still interested in installing a solar system in the future.**

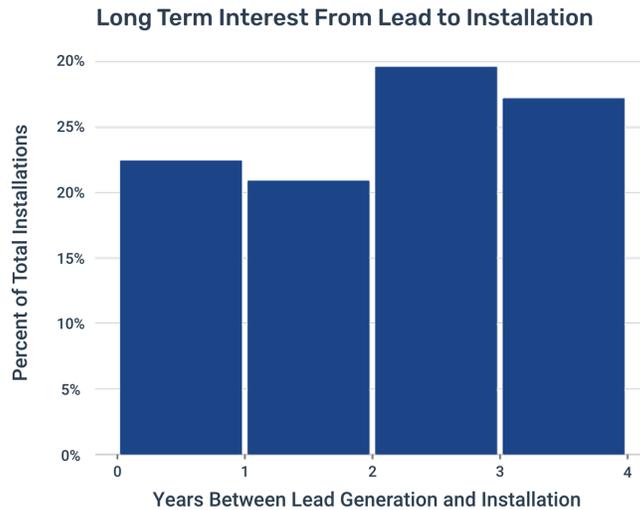


FIGURE 2: A histogram of the time between lead and installation for consumers who installed a system within four years of requesting a quote. (excluding leads generated after 2017)

One of the most interesting findings was the fact that **leads from the earliest surveyed time period (Jan. 2016) were still getting solar installed at the end of 2020.** These results offer exciting possibilities for installers to enhance their marketing and communications efforts to close sales for years after a lead is received.

Recommendations

Although closing a lead quickly is the best-case scenario, the survey data supports the theory that with an expensive elective purchase like solar, some homeowners need a long period of time to make a decision, and that long-term marketing and measurement of lead success may provide significant value to installers.

Case Study: Late-Stage Lead Conversion Barriers

Analysis of respondents who nearly installed residential solar

For solar installers, converting a lead to a sale requires time and labor-intensive steps, including one-on-one discussions with the prospective customer, site assessments, and drawing up contracts. However, these steps can go to waste, due to late-stage barriers that cause a customer to not install solar. For this reason, **improving support and providing resources to overcome any late-stage barriers before they arise can help improve lead-to-sale rates.** To identify trends in late-stage barriers, homeowners who received a finalized design and price from a solar installer (but did not install panels) were asked to respond to the prompt, “Please rate how each of these factors played into your overall decision to not install solar panels.”

Respondents in this category have had exposure to potential barriers that come later in the solar installation process, such as permitting. For this reason, it is important to find what late-stage obstacles prevent the completion of the installation process. The following visual shows the distribution of respondent ratings to how strongly each factor impacted their decision to not install solar from “Not Important” to “Very Important”.

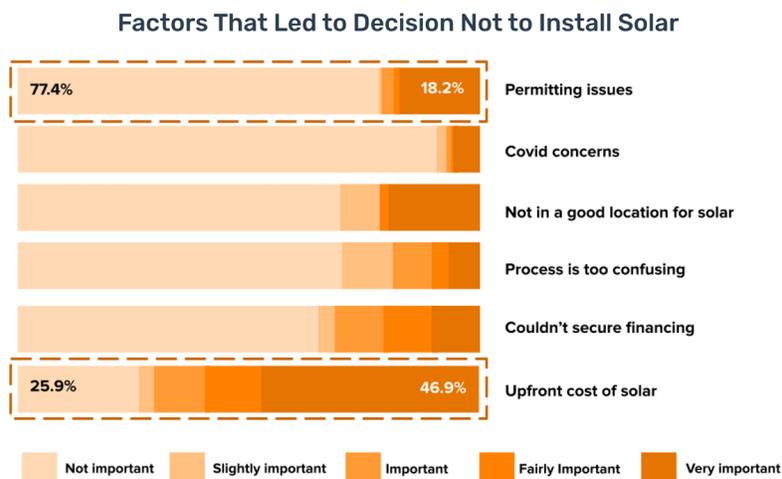


FIGURE 3: Rating the importance of each barrier by respondents who received a finalized design and price from a solar installer.

Upfront cost

The upfront cost of solar was rated as “Important”, “Fairly Important”, or “Very Important” by 72.5% of respondents. Considering most respondents received a quote early in the process, either online or directly from an installer, one would expect that the respondent would be able to determine that upfront costs were prohibitive to them before continuing the process.

Based on these results, however, we can see this is not the case. These respondents received an estimate, communicated with installers, had an on-site evaluation, and received a finalized price before deciding that the price exceeded their willingness to pay.

Further research is needed to determine why some respondents continued the process after receiving the initial price estimate. Some possible hypotheses are inability to qualify for acceptable financing terms, potential aversion to financial commitment from the homeowner, or lack of understanding regarding the true ROI of a home solar installation.

Higher availability of zero-down or deferred financing options which are personalized to the homeowners' financial situation could help with their willingness to commit financially.

Permitting

The impact of permitting issues was nearly binary because every respondent who almost installed solar classified permitting issues as one of the ends of the spectrum, either "Not Important" or "Very Important", with very few in between.

For the majority of respondents who did not install solar, permitting was entirely insignificant and mostly ranked as "Not Important" (77.4%). This indicates that for the typical homeowner who reaches an advanced stage in the process of installing solar, permitting is likely not a factor in the decision not to install.

18.2% of respondents did rate permitting as "Very Important".

Permitting requirements can be costly, both in terms of time and money, and vary by locality. Perhaps the impact of permitting issues for this 18.2% is at least partially a reflection of local laws and restrictions, with those finding it prohibitive where the process is less streamlined.

Case Study: Financial Incentives Awareness Gap

Higher awareness of incentives and financing options could lead to more installations

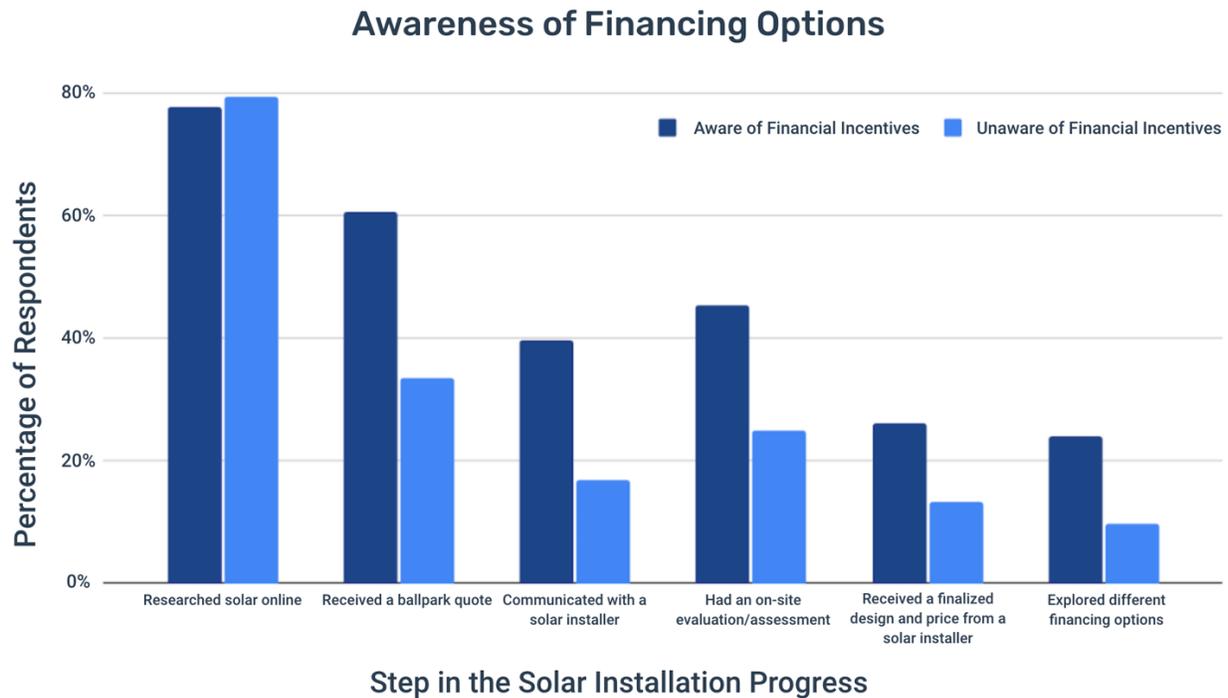


FIGURE 4: This bar chart compares the proportion of respondents who inquired about installing solar and the steps in the lead conversion process they completed, but ultimately did not install solar. The respondents were either aware (dark blue) or unaware (light blue) of financial incentives.

Of the survey respondents, 52% were aware of at least one financial incentive for installing solar. As seen in Figure 4 above, a similar percentage (~79%), of both financial incentive aware and unaware-respondents researched solar online. This is surprising because online research should yield results about financial incentives.

Awareness of financial incentives was strongly correlated with completing each of the other solar installation steps in the survey, as in, more likely to communicate with a solar installer, have an on-site assessment, and so on. This suggests that the incentives are working as intended and that raising awareness of them might increase solar adoption.

Thus, increasing consumer awareness of financial incentives would help address the pain point of upfront costs noted in the first case study. One popular incentive that has greatly increased the adoption of solar is the Solar Massachusetts Renewable Target program, aptly nicknamed the SMART program, which pays solar homeowners a fixed rate per kilowatt-hour of solar energy produced for 10 years. The structure of the SMART program encourages homeowners to go solar sooner, promotes the adoption of battery storage, and provides enough savings to cut the payback period of a solar panel system installed in Massachusetts in half.

Because each state that offers solar incentives has their own specific program, creating a general education campaign would be difficult. The exception to this is the federal tax credit, which represents an opportunity for homeowners in every state to receive a tax credit on the cost to install solar, but this will expire in 2024 without congressional action.

Another noteworthy result is the low number of respondents who explored different financing options, such as loans specific to solar. The topic of personalized financing is not discussed until later in the installation process, after the finalized design and price is set. Therefore, people may not realize that personalized financing plans can reduce the upfront cost and allow them to pay off their solar installation in more manageable amounts over time.

A possible explanation for this trend would be that upfront costs deter potential customers from going much further in the process. As noted in the survey results, financial incentives like the federal tax credit are one of the biggest factors leading to the decision to install solar, but consumers might not be aware of these financial incentives. **To help convert homeowners who are hesitant about the upfront costs, incentives and personal financing options need to be made available early in the process.**

Case Study: Installation Driver Relationships

Ranking of drivers

Respondents answered the question “How important were the following factors in your decision to install solar?” by rating each driver on a scale of 1 to 5 (“Not Important” to “Very Important”). Answers were also analyzed by the respondents’ primary factor.

The following visual shows the percentage of respondents that ranked each driver as the most important of all of the presented factors. For example, a respondent could have rated “Lower carbon footprint” a 4, everything else a 3, 2, or 1, and “Lower carbon footprint” would be counted as the driver they rated most important. Ties were broken by assigning them to all tied drivers.

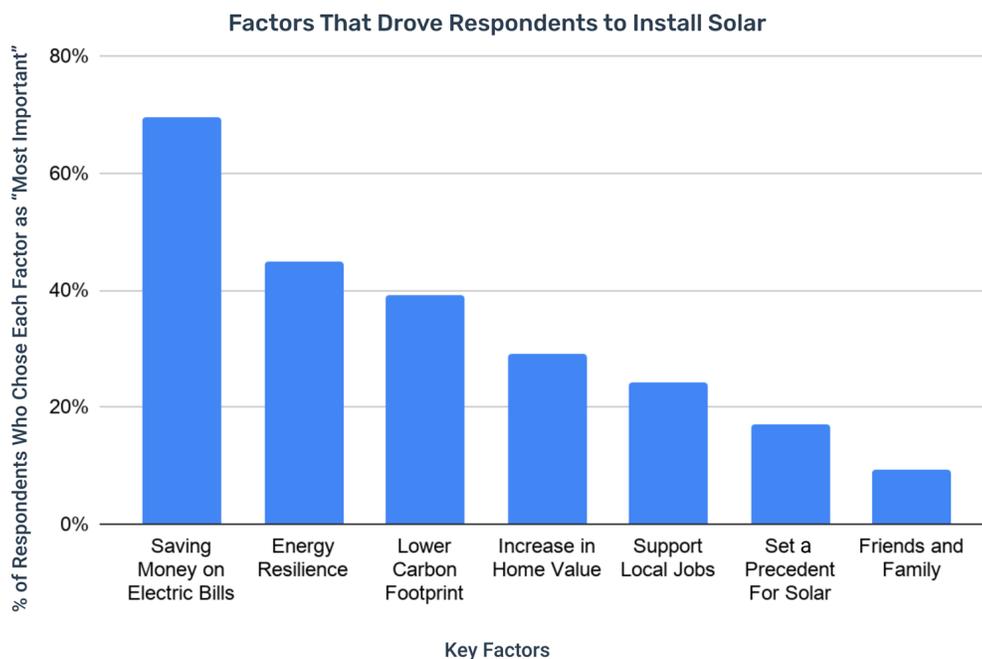


FIGURE 5: Percentage of respondents who ranked each driver as most important. Ties were broken by assigning them to all tied drivers.

“Saving money on electricity bills” was ranked as most important by the most respondents. This driver was also rated a 5 by 58.2% of respondents. **“Energy resilience during natural disasters” was rated a 5 by 30.1% of respondents.** This driver was also ranked as most important by the second-largest number of respondents. This suggests that energy resilience is a primary driver for a subset of respondents.

Similarly, “Lower carbon footprint” was rated a 5 by 30.4% of respondents. It was also ranked as most important by the third-largest number of respondents. This suggests that for a subset of the population, the appeal of a “Lower carbon footprint” is a primary driver to install solar.

Further analysis should be conducted to determine characteristics of these subsets of the population for whom different factors are the primary driver.

“Friends and family recommended installing solar” was ranked as most important by the smallest number of respondents. Furthermore, the mean rating of this factor for respondents who rated it as most important was only a 2.7, between “Slightly Important” and “Important” on the given scale.

This low value, while still being the highest rating for these respondents, suggests perhaps these respondents did not see their primary driver in installing solar represented in possible answer choices, were conservative in rating strongly, or some other unknown factor. Further research should be conducted to determine what is causing these respondents to rate all driver options relatively low.

Correlation matrix of rating of drivers

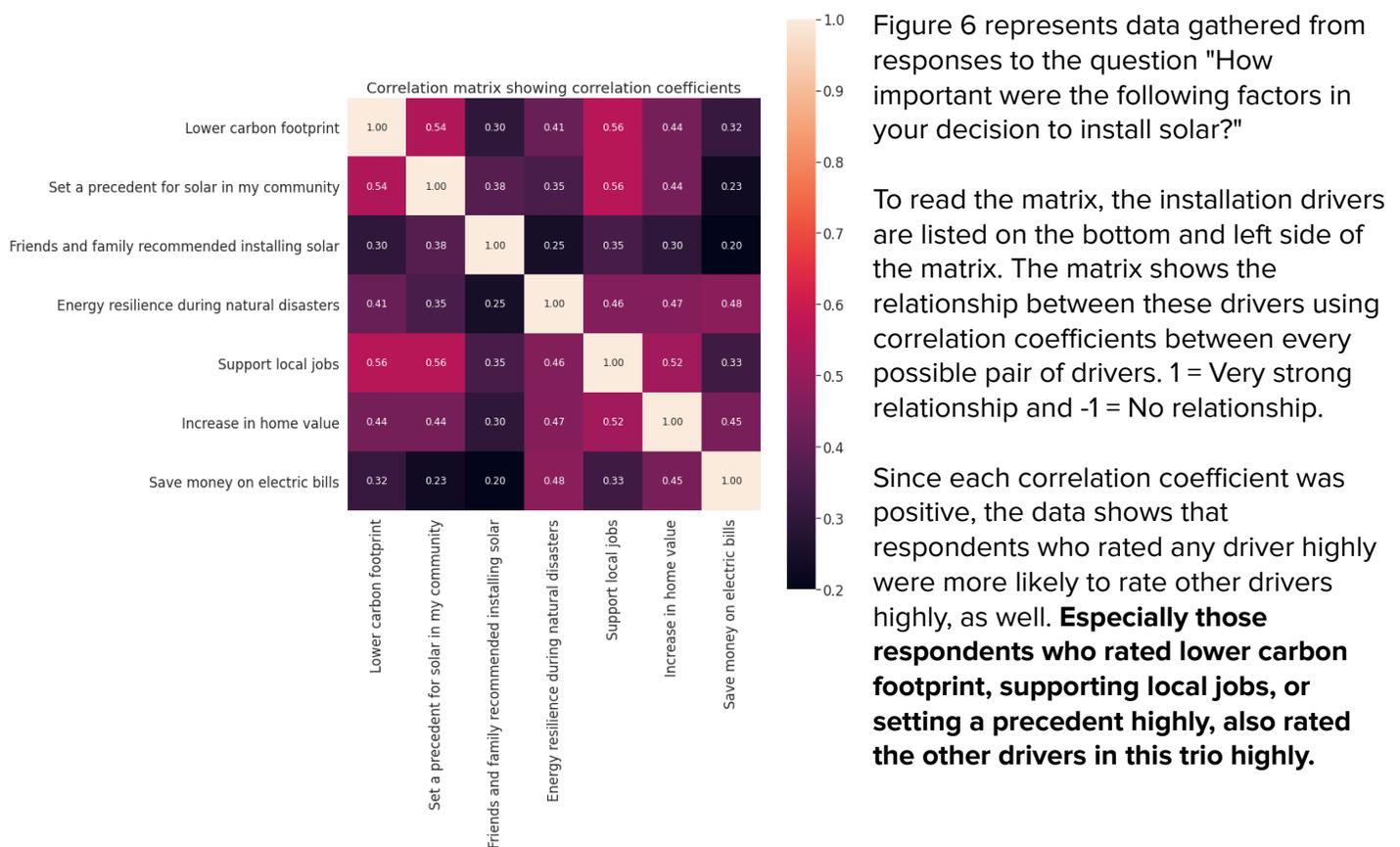


FIGURE 6: Correlation coefficients between each driver based on respondent ratings of each driver responding to the question, “How important were the following factors in your decision to install solar?”

This shows that in many cases, there is not one single driver that leads to respondents' decision to install solar. Additionally, some related drivers, like setting a precedent and supporting local jobs, showcase a mindset that is drawn towards solar as a collective good. While other related drivers like saving money on electric bills, energy resilience, and increase in home value are highly correlated and showcase an “individualistic” mindset.

Case Study: Energy Resilience & Natural Disasters

Energy resilience benefits of solar + storage in natural disasters

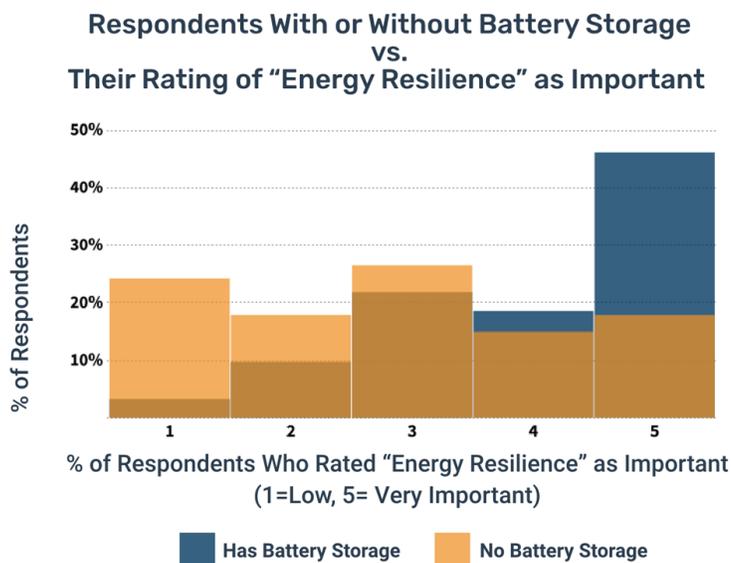
The United States faced 20 tropical storms in 2020, and each one caused hundreds of power outages¹. Anything from lightning to flying debris can damage power lines and cause an interruption to the household power supply. **Having a solar power system, with the ability to be independent from the grid using a storage battery, allows for greater resilience and thus fewer worries about power outages during natural disasters.**

Solar panels are built to be resistant against a variety of natural disasters, like hail. But, in the case that the solar system does get damaged and cannot operate properly, warranties or most homeowners insurance policies cover the cost of replacing the solar system or panels².

Many people who expect frequent harsh weather conditions may consider installing solar panels + storage not only for financial benefits, but also for grid independence and energy security during power outages.

Energy resilience and battery storage

The plot below depicts the distribution of responses, from one to five, to the question, “How important is energy resilience during natural disasters as a part of your decision to install solar?”



As can be seen in Figure 7, the two groups depicted, (those with battery storage systems and those without), belong to visibly distinct underlying distributions.

While the distribution of this ranking for those without storage systems is nearly uniform, **those with energy storage systems ranked energy resilience as a much more important factor, with the mode being a five.** Those without storage systems found energy resilience to be far less significant, with a mode value of three.

FIGURE 7: The distribution of the importance of energy resilience, from one to five, for those with and without battery storage systems.

1: [Natural Disasters in 2020](#)

2: [Nationwide Homeowners Insurance Coverage for Solar Panels](#)

Interestingly, however, the importance of energy resilience as a reason to install solar panels did not vary significantly, according to the most common disaster in the location of the homeowner. The mean values for each disaster type are within a range of 0.12, indicating there is likely little difference in the underlying distribution of this parameter when segregated by disaster type.

Future analysis may uncover trends between energy resilience preferences and natural disaster frequency, or blackout frequency and duration.

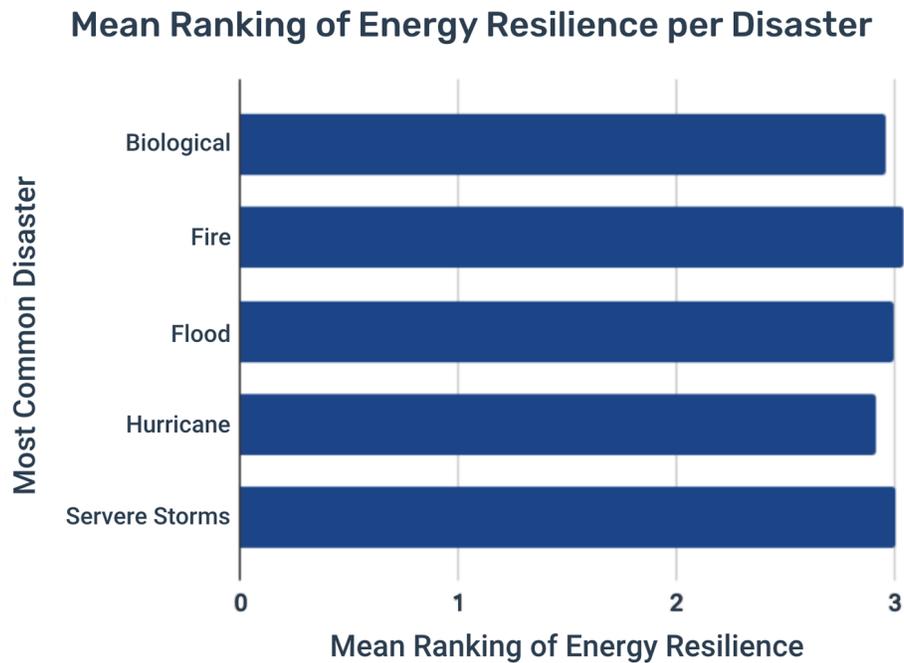


FIGURE 8: Mean importance ranking by most frequently-occurring natural disaster in location of the home.

Key points derived from the report

Surprising finds:

- About one-third of leads that installed solar did so six months after receiving their original quote
- People who received solar quotes in 2016 were installing solar panels into 2020, debunking the claim that leads can only convert within a few weeks or months. Measuring ROI on solar marketing activities should not be confined to 1-3 months after lead receipt.
- “Increased home value” and “supporting local jobs” are emerging key factors in the decision for homeowners to install solar
- Interest is increasing in battery storage, specifically for the purpose of energy resilience during natural disasters

Confirmed trends:

- The primary motivation for installing solar panels is to save money on electric bills, followed by disaster resilience and desire to reduce emissions
- The federal tax credit is the most important incentive for installing solar, followed by net metering
- The upfront cost of installing solar is daunting but can be mitigated by increased awareness of available local, state, and federal financial savings incentives.

