

# Energy Trust of Oregon: Solar Verification Process Evaluation Report

May 10, 2018

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## Executive Summary

Working on behalf of Energy Trust of Oregon (Energy Trust), Cadmus completed an evaluation of Energy Trust's Solar program verification process. This process is used by Energy Trust to conduct quality assurance (QA) verifications on solar photovoltaic (PV) systems that receive incentives through Energy Trust's Solar Electric program. These verifications typically include technical design reviews and onsite reviews of funded installations to ensure that they comply with all relevant requirements of the Solar Electric program.

In this study, Cadmus completed detailed interviews with program staff, trade allies, and verifiers as well as an online survey with participants in the Solar Electric program. The overall goal of the research was to evaluate the effectiveness and value of the verification process.

### *Findings and Conclusions*

Cadmus found that the verification process is adding substantial value to the Oregon solar industry. Positive impacts of the verification process include:

- **Improved Installation Quality:** Over the last several years, the issues found onsite during the verification process have decreased. For example, in 2015 approximately 28% of sites had issues found during onsite verification, compared with only 20% in 2017 (see Section 1).
- **Providing a Positive Customer Experience:** Ninety-three percent of program participants expressed a high degree of satisfaction with their overall experience, including their experience with the verifiers (e.g., professionalism, timeliness, thoroughness, ease of scheduling), and the ease of identifying and selecting a trade ally (see Section 5).
- **Public Reporting of Verification Results is Important to Participants:** The study found reporting verification results may lead to fewer installation issues. Though the solar trade ally rating process remains fairly new, each verifier reported noticing improvements in installation quality since verification results began contributing to public-facing ratings. In particular, verifiers noted a reduced incidence of minor installation issues, suspecting that trade allies conducted their work a bit more carefully to avoid lowering their ratings (see Section 3).
- **Verifiers Provide a Valuable Service to Participants and Trade Allies:** Though most customers would not be willing to procure third-party verification services on their own, a majority did indicate that these services had a tangible value that they would be willing to pay something for (see Section 3). In addition, the majority of trade allies (6 out of 10) reported benefits relating to improving installer diligence and broad benefits to the reputation of the regional solar industry attributable to the verification process (see Section 8).

The evaluation noted several additional conclusions:

- Energy Trust's incentives in conjunction with tax credits, and design review, are positive determining factors in participants installing solar electric systems (see Section 4).



- Energy Trust has made progress on the working relationship between trade allies and verifiers, but there are still some issues with trade allies having sufficient access (e.g., getting timely responses to questions) to verifiers (see Section 5).
- Remote verification, a method of verification using pictures and other information thereby allowing review without being on-site, can gain additional trade ally acceptance if it not overly burdensome in time and cost (see Section 6).
- Opportunity exists to reduce trade ally costs and streamline verification processes by reviewing Energy Trust standards against industry best practices, to identify any standards that are unnecessary (see Section 8).
- There are some issues on consistency and communication between verifiers, likely due to verifiers' high workload for project field verifications (see Section 2).

## **Recommendations**

Though the overall process appears to be providing value to the industry, Cadmus identified several opportunities to improve the verification process, including:

- **Increase verifier consistency.** In discussing the verification process with verifiers, Cadmus noted that there are substantial differences in how verifiers conduct their work. For example, verifiers provided variable responses about time spent onsite, necessity of accessing rooftop equipment, and how frequently the verifier might open and inspect enclosures containing wiring for PV system equipment. Trade allies also expressed frustration at the variability between verifiers. Energy Trust may consider steps to standardize the level of verification rigor between verifiers.
- **Increase the number of verifiers or accelerate remote verification.** If Energy Trust intends to continue with the same level of verification, they may need to increase the number of verifiers or accelerate remote verification to reduce heavy workloads and minimize delays (by the conclusion of this report, the number of verifiers had decreased). If, however, Energy Trust sees a persistent decline in applications as a result of the discontinuation of the Residential Energy Tax Credits, Energy Trust may want to delay adding new verifiers until applications return to levels seen during this evaluation.
- **Identify specific inputs required** from trade allies and minimize additional requests. Too much additional work required of trade allies erases the marginal value of the incentives. Energy Trust should consider convening a focus group of trade allies to discuss modifications to requirements and standards that all parties may find an agreeable balance to provide the necessary information for verification without undue strain.

In addition to the existing verification process, roll-out of the remote verification process should continue.

- **Continue pursuing remote verification.** Remote verification is beginning to show promise but is not yet established. It is generally accepted by trade allies and has the potential for large cost and time savings for Energy Trust verifiers.



# MEMO

**To:** Board of Directors  
**From:** Jeni Hall, Sr. Project Manager – Solar  
Sarah Castor, Evaluation Sr. Project Manager  
**Date:** June 28, 2018  
**Re:** Staff Response to the Solar Verification Process Evaluation

Energy Trust of Oregon is one of the few solar program implementers in the U.S. that verifies all incentivized solar electric systems. Verification is intended to ensure that systems are designed and installed to maximize generation, protect customer and ratepayer investments and support a sustainable solar electric industry in Oregon. Energy Trust undertook a process evaluation of its solar verification services with the goal of assessing the value these services provide to customers, trade ally contractors and the Oregon ratepayers who fund the organization.

The evaluation concluded that, in alignment with its goals, Energy Trust's solar verification process improves installation quality, provides a positive customer experience and provides value to trade allies. The evaluation also noted that the star rating system implemented in 2017 for solar trade allies is seen as useful by customers and, according to verifiers, appears to improve installation quality.

As noted in the evaluation, the Solar program currently operates with fewer verifiers than in 2017 due to two verifiers retiring. Energy Trust is open to adding additional verifiers and will release a request for qualifications (RFQ) for verification services in summer 2018.

Given uncertainty about future project volume, Energy Trust is attempting to make the program scalable and responsive to market demands. To this end, Energy Trust has also implemented process changes to assist with technical design review on simple residential projects and is making greater use of remote verification. As new verifiers are added, Energy Trust will emphasize consistency in verification practices through verifier training.

At this time, 22 trade allies are approved for remote verification using Site Capture, an internet-based tool, and Energy Trust plans to continue to approve trade allies for remote verification based on their installation quality. Energy Trust has seen positive results so far and continues to support trade allies as they incorporate quality management processes into their internal workflows and use Site Capture to create photo commissioning reports.

While the evaluation determined that the program's verification services provide value, it noted that quantifying that value in dollars is challenging. Energy Trust is committed to continuous improvement of program efficiency and effectiveness. Energy Trust will explore the evaluator's suggestions for quantifying benefits in an effort to compare benefits to program costs and make the best use of resources.

## Introduction

Energy Trust's Solar program (the program) offers incentives for the installation of solar photovoltaic (PV) systems by residential and nonresidential customers. Customers wishing to participate in Energy Trust's program first select trade allies to complete their solar electric installations.<sup>1</sup> The selected trade ally submits to Energy Trust a program application and system design for review.

Energy Trust contracts with a pool of independent, third-party solar verifiers to review designed and installed solar electric systems and to make recommendations to Energy Trust as to whether or not a system is eligible to receive program incentives. The verification seeks to confirm that the installation meets program requirements in terms of workmanship quality and system performance.<sup>2</sup> This verification occurs in addition to jurisdictional inspections, which focus on health and safety requirements.

If the verifier finds that the installation does not meet program requirements, Energy Trust will notify the trade ally with a notice of corrections required and the trade ally must make all the required corrections within 30 days of notification. Once the corrections have been made, the trade ally must contact the assigned verifier to schedule a new site visit. Energy Trust processes the incentive after the verifier confirms the installation meets all program requirements.

Almost all verifications involve on-site inspections by program-approved verifiers. The program is currently exploring a remote verification process – a method of verification using pictures and other information, thereby allowing review without being on-site – to replace self-verification, increase quality control, and facilitate inspection of 100% of projects.<sup>3</sup>

The results of each verification are used in the customer-facing star rating system for program trade allies, which was developed in late 2016 and rolled out in the middle of 2017. The rating is based on scoring for three components, each of which can earn the trade ally up to one full star (for a maximum of three stars): program service, quality service and customer service. Verifiers provide input into both the program service and quality service scores:

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<sup>1</sup> Installations must be completed by an Energy Trust approved trade ally. Participants may identify trade allies through several paths, including requesting a site analysis and bid directly through Energy Trust's website, selecting a trade ally from Energy Trust's list of approved trade allies, and recommendations from people they know.

<sup>2</sup> A Solar Electric Installation Checklist of items verified by Energy Trust can be found at [https://insider.energytrust.org/wp-content/uploads/sle\\_rq\\_pv\\_sysreq.pdf](https://insider.energytrust.org/wp-content/uploads/sle_rq_pv_sysreq.pdf)

<sup>3</sup> Self-verification was a process by which some trade allies that had demonstrated consistently high-quality work were approved to self-verify their projects. Energy Trust has phased out self-verification except for some legacy projects.



- Program service: Verifiers, along with program staff, score the completeness of each application they review and points are deducted for application or system design errors.
- Quality service: Verifiers inspect installed systems and points are deducted for major and minor corrective actions required.

Trade allies with two or more stars are eligible for additional benefits through the program, such as higher levels of business development and cooperative marketing funds, as well as participation in pilot programs (for 3-star allies) and Solar Leads (for 2.5 and 3-star allies). Solar Leads is a service hosted by Energy Trust that allows customers to request a bid (via web-based form) for installation of a solar system at their home or business. The customer enters information about the site and Energy Trust assigns two or three trade allies to respond to the request directly. The goals of the Solar Leads service are to improve the customer experience and provide highly qualified leads to solar trade allies, thereby reducing their customer acquisition costs.

### **Research Objectives**

Through this evaluation, Cadmus addressed the following:

- What benefits do Energy Trust Solar program staff see from the verification process? What do they see as the primary values to Energy Trust, trade allies, and customers? What changes are being considered—either to the verification process itself or to the program—that might affect verifiers or the verification process?
- What experiences have verifiers had with the solar program and the verification process? What do they consider as the primary values of the verification process for Energy Trust, trade allies, and customers? Do they offer suggestions for ways to improve the process?
- What benefits do trade allies realize from the verification process? What challenges do they experience with the process? Do they have suggestions for process improvements? Has the star rating system changed their experiences with or perception of the verification process?
- Do participants see value in the verification process? How much do they currently interact with verifiers? What kind of experiences do they have in doing so? Do differences occur in perceptions or experiences between residential and commercial participants? Do respondents have suggestions for process improvements?
- As the solar trade ally rating system is relatively new, its impacts on trade ally performance are just starting to appear. Do program data yet provide evidence that trade allies are improving their performance? What metrics could the program use to assess star rating system impacts and to ensure that they meet the program’s objectives?
- Can the value of the verification process be quantified in dollars? Can this value, in terms of improved performance and reduced failure rates, be compared to programs outside of Oregon that do not perform verifications? What value do trade allies receive from Energy Trust education and training or from other program elements?

## Methodology

Cadmus first reviewed program documents and data addressing the following:

- Project, trade ally, and customer data from Energy Trust’s tracking system
- Summary data on verification results
- Categories of major and minor corrective actions resulting from verifications
- Verification pass/fail rates

Cadmus followed the review with in-depth interviews of key program staff at Energy Trust, using the results to develop interview guides for solar electric project verifiers and trade allies, and a survey instrument for participants. Cadmus provided each group’s draft interview guide or survey instrument for review by Energy Trust’s Evaluation Senior Project Manager and incorporated resulting feedback before finalizing the guides. Cadmus then conducted phone-based interviews (approximately 30 minutes in length) with verifiers (4) and trade allies (10), and online surveys with participants whose solar PV installations were verified between August and early November 2017. Table 1 illustrates quotas and completed surveys by group.

**Table 1. Participant Online Survey**

|                                       | Residential | Nonresidential |
|---------------------------------------|-------------|----------------|
| Participant sample                    | 491         | 21             |
| Participants who completed the survey | 95          | 2*             |

\*Due to the small number of business respondents, the study reports these two participants’ responses as part of the total.

## Energy Trust Verifier Profile

To better understand verifiers’ experiences with the solar program and the verification process, Cadmus conducted detailed phone interviews with each of the four Energy Trust verifiers. Through these phone interviews, Cadmus solicited feedback on the verification process, program design, verifier background, and verifier methods.

## Trade Ally Profile

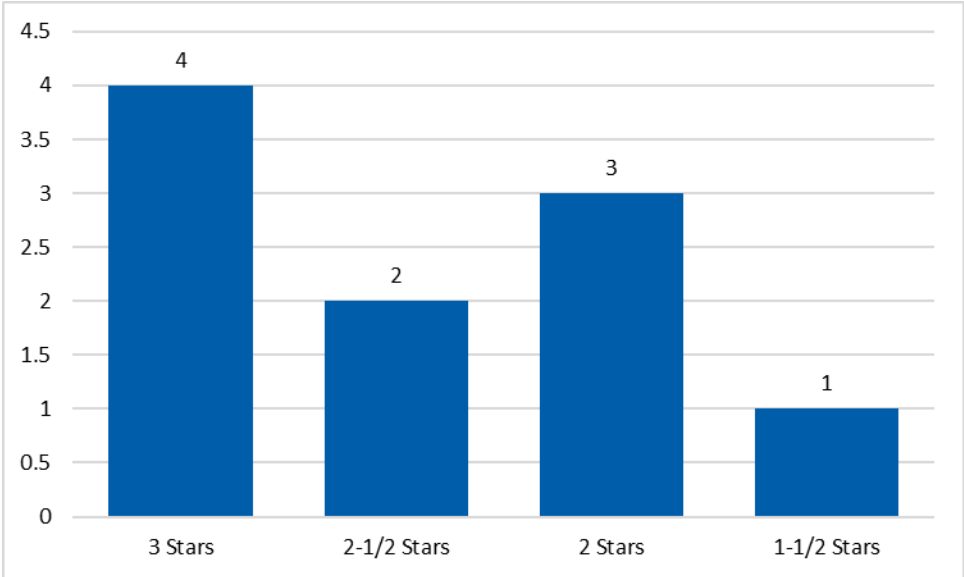
Cadmus interviewed trade allies to better understand their experiences with the verification process, their perspectives on the solar trade ally rating system, their opinions on remote verification, and their use of remote shade tools.

Trade ally companies participating in the solar electric program varied widely. Of those interviewed (n=10), five have worked with Energy Trust’s Solar Electric program for more than five years, and five have participated for less than three years. These companies varied significantly in size, employing two to 60 people in Oregon, and 50 to more than 100 people within their entire corporation, with one trade ally employing 11,000 people across the United States.



All trade allies interviewed by Cadmus earned from one-and-a-half to three stars through Energy Trust’s Solar Trade Ally Rating system, which, using one to three stars, rates trade allies’ customer service, installation quality, and system design. Figure 1 illustrates the distribution of the ten interviewed trade allies by rating.

**Figure 1. Solar Trade Ally Rating**



Source: Trade ally list including ratings provided by Energy Trust as of October 6, 2017.

Eighty percent of interviewed trade allies installed both commercial and residential projects (n=10), although trade allies reported installing substantially more residential projects than commercial projects per year. Residential estimates per trade ally ranged from 10 projects to 1,700 projects per year, while commercial project estimates per trade ally ranged from two projects to 40 projects per year. Table 2 shows Energy Trust projects as a percentage of total reported projects per trade ally per year.

**Table 2. Energy Trust Projects as a Percentage of Total Projects**

| Installations per Year |      |     |         |         |       |       |      |     |             |     |
|------------------------|------|-----|---------|---------|-------|-------|------|-----|-------------|-----|
| Trade Ally             | 1    | 2   | 3       | 4       | 5     | 6     | 7    | 8   | 9           | 10  |
| <b>Residential</b>     |      |     |         |         |       |       |      |     |             |     |
| Total                  | 360  | 200 | 350-400 | 300     | 50-60 | 60-80 | 10   | 50  | 1,400-1,700 | 50  |
| Energy Trust           | 95%  | 75% | 25%     | 10%-15% | 90%   | 75%   | 100% | 10% | 10%         | 50% |
| <b>Commercial</b>      |      |     |         |         |       |       |      |     |             |     |
| Total                  | 2    | 2-5 | 4       | 30-40   | 20-30 | 15-20 | 8    | 5-6 | 0           | 0   |
| Energy Trust           | 100% | 50% | 0%      | 10%     | 50%   | 75%   | 75%  | 25% | N/A         | N/A |

Source: Energy Trust Solar Electric Program—Verification Evaluation Trade Ally Interview Guide 2017 Questions: 23 and 24.

## Findings

This section of the report provides detailed findings collected from Cadmus’ survey of program participants, and interviews with program verifiers and trade allies. These findings are reported for the following areas:

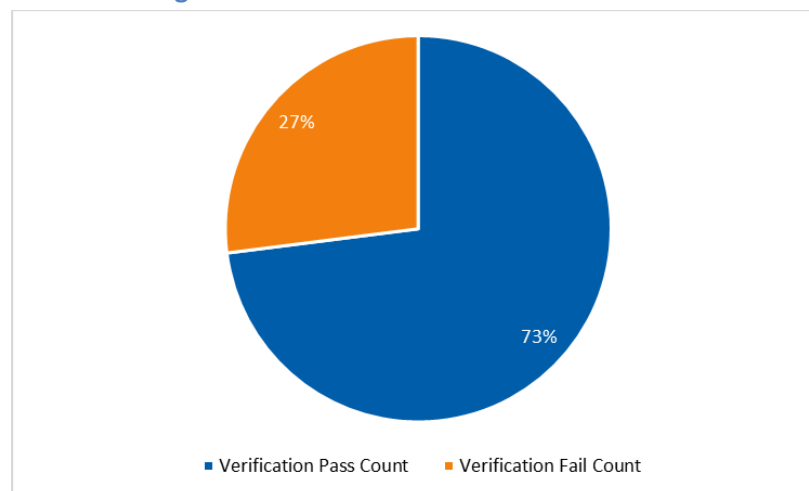
1. Verification process
2. Verifier consistency
3. Solar trade ally rating system
4. Influence of program services and financial incentives
5. Participant satisfaction
6. Remote verification
7. Trade ally tools
8. Value of the verification program

### 1. Verification Process

#### Site Verification Statistics

As shown in Figure 2, Cadmus reviewed the data for 4,298 site verifications from 2015–2017 and found a 73% pass rate.

**Figure 2. Site Verification Pass or Fail Count**



Source: Project tracking data provided by Energy Trust

Violations fall into two categories: major and minor. Table 3 breaks down findings from the verification process.

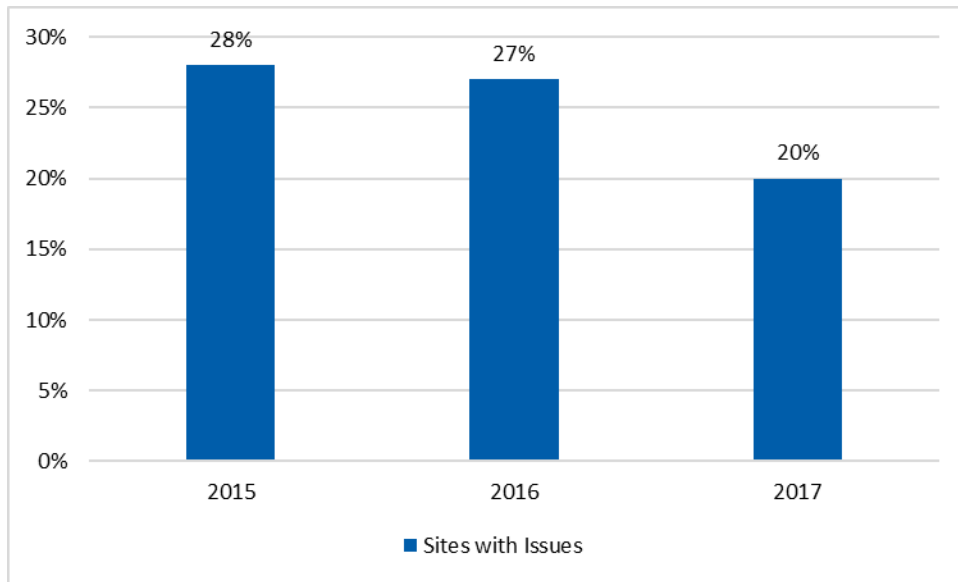


**Table 3. Verification Inspection Violation Site Counts**

|            | Total Major Violations | Sites with Major Violations | Total Minor Violations | Sites with Only Minor Violations | Sites with No Violations |
|------------|------------------------|-----------------------------|------------------------|----------------------------------|--------------------------|
| Site Count | 987                    | 711                         | 775                    | 375                              | 3,212                    |

As shown in Figure 3, verification results show a lower percentage of sites encountered issues each year from 2015 through 2017 (20% of the sites in 2017, compared to 27% in 2016 and 28% in 2015).

**Figure 3. Percentage of Sites with Issues-by Year**



Source: Project tracking data provided by Energy Trust

### Formal Quality Management Plans

Most trade allies assigned staff to track Energy Trust projects, but employed varying degrees of formal quality management plans. Nine of the 10 trade allies identified staff or departments that completed, submitted, and tracked Energy Trust program applications. Applicable staff titles included the following:

- Principal
- Project Administrator/Coordinator/Manager
- Permit Technician
- Permit and Inspections Coordinator
- Incentive Coordinator

One trade ally did not dedicate staff to this task.

When asked, however, if their firms had established quality management plans, eight trade allies described somewhat vague processes that varied from “informal” systems composed of one person checking installations (two respondents), to use of checklists (two respondents), to four trade allies

describing formal oversight processes, some of which included weekly meetings with field technicians to insure installations complied with Energy Trust standards. Two trade allies did not employ quality management plans.

Regarding inspections conducted by the trade ally organizations, five trade allies inspected 100% of their installations, using photos and quality control inspectors on site. Two trade allies inspected 25% to 50% of their installations (one using photos, the other using on-site quality control inspectors), one inspected 60% to 70% using photos, and two trade allies did not know or did not specify a percentage. All trade allies used in-house staff for quality control, one utilized third-party reviewers on structural items, and also a third-party financing provider that does reviews.

### Design, Installation, and Documentation Processes

Trade allies described improvements made to their design, installation, and documentation processes due to Energy Trust verification. Because of their experience with the verifier program, seven of 10 trade allies made changes to their processes. While some of these were small changes (such as updating internal checklists to align with Energy Trust checklists or binding an owner's manual to last longer), others proved more substantial:

- Taking a tighter grid with the SunEye shade measurement tool and requiring manager approval for readings under 77%
- Refining internal site documentation
- Increased labeling
- Developing more robust checklists
- Having staff present during verifications to answer questions

### Comparison to non-Energy Trust Projects

Energy Trust installations may be of higher quality than non-Energy Trust projects. Two verifiers completed similar verification services on projects not receiving Energy Trust incentives. One completed similar work for a local utility and indicated very similar quality levels due to substantial overlap between trade allies. The other completed similar work in jurisdictions around the United States, including New York, California, and Texas. This verifier indicated that Energy Trust projects generally were of higher quality than those in other areas. The verifier attributed this to the long-standing relationships Energy Trust has built with trade allies and verifiers. The verifier also indicated that Oregon Authorities Having Jurisdiction (AHJs), such as electrical inspectors, tend to be better educated about solar PV than AHJs in other regions.

## 2. Verifier Consistency

### Design Review Methods

All verifiers interviewed described their processes for completing design reviews. Though some variability occurred in how verifiers described this process, each cited use of industry-standard tools





(such as string sizing tools, and voltage drop calculations) and Energy Trust program requirements. Verifiers appeared to spend approximately the same amount of time (10 to 20 minutes) for a relatively simple design to approximately three hours for a more complex design. Verifiers expressed that they completed reviews more efficiently when they could be grouped by trade allies and reviewed in batches.

### Field Verification

Verifiers did not necessarily produce consistent field verifications. In running quality management programs, consistency is very important to prevent mixed feedback to the market. Having contractors adjust their installation practices based on verifiers' feedback, for example, only to receive contradictory feedback from another source, can lead to frustration and challenges for the trade allies involved. Verifier interviews raised several elements that could lead to inconsistent results between verifiers.

The time that verifiers spent in inspecting a system—as well as what they inspected—partly drove on-site verifications' thoroughness. During interviews, each verifier described a different approach to complete verifications. In general, verifiers spending less time on site, opened fewer enclosures, or failed to access the roof tended to find fewer issues than those accessing all system components and spend longer time on site.

Verifier time on site, however, varied. One verifier reported spending 30 to 60 minutes on site. Other verifiers reported spending as little as 15 minutes, though all said they might spend up to 60 minutes on site if they encountered serious concerns about an installation.

Access to equipment (or lack thereof) also played an important role in how many issues a verifier might identify. As with time on site, verifiers reported differing levels of equipment access. For example, when asked about how many roofs they accessed for verifications, verifiers reported a range, from less than 10% of roofs for one verifier to approximately 70% of roofs for another. With respect to opening enclosures (e.g., disconnects, panelboards), the verifiers again reported a range. One verifier indicated that he selected "at least one" enclosure per project to inspect, another indicated that he opened all enclosures that could be accessed without a tool. The remaining two verifiers indicated that they opened all possible enclosures during verifications.

Furthermore, verifier methods for documenting their findings varied. All verifiers reported using Energy Trust's checklist, albeit in their own ways. One verifier "referenced" the checklist but did not directly use it to record on-site findings. Another used it, but automatically checked off certain items that they believed were reviewed by a local authority or the verifier conducting the design review. Other verifiers reported using the checklists and maintaining completed hardcopy checklists in their files.

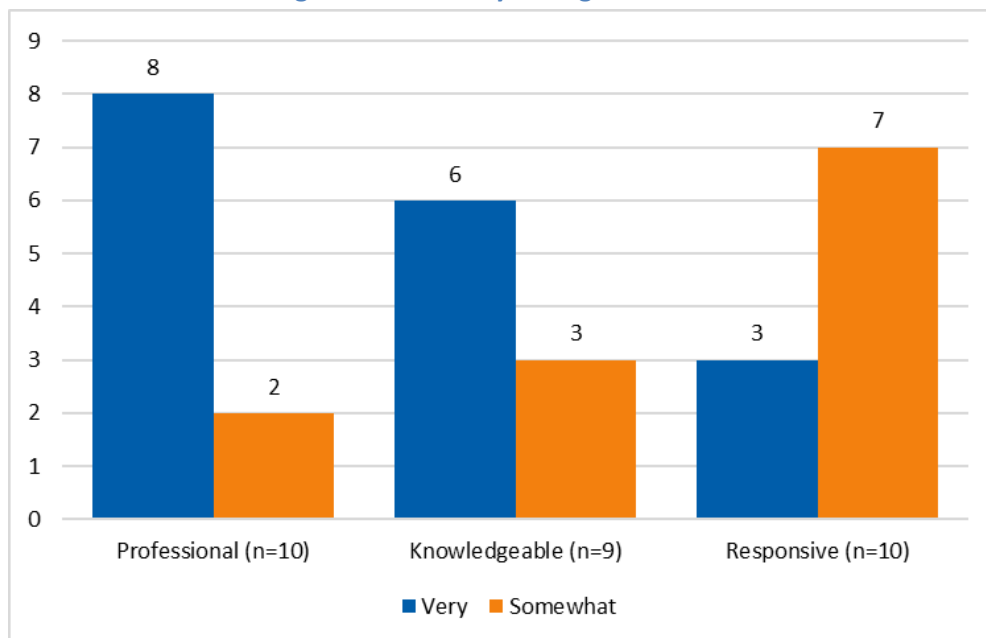
In all cases, verifiers reported relatively sporadic use of other documents and digital photographs, primarily using photographs to record the most controversial of issues found. None of the verifiers fully photographed systems that they verified, which may pose challenges if Energy Trust must confirm equipment or installation details post-verification.

Energy Trust’s current process is not well-suited to addressing these inconsistencies, as each verifier tends to conduct verifications in their assigned region. This may lead to trade allies tailoring their installations to their region’s verifier, even if other verifiers may not necessarily take the same approach. Consequently, a passing verification in one region may not necessarily pass in a different region.

**Trade Ally Interactions with Verifiers**

As shown in Figure 4, a majority of trade allies rated the verifiers as very professional, technically knowledgeable, and somewhat responsive (saying verifiers are sometimes very busy, and reviewing revisions or correcting wrongful citations could take extra time). Trade allies also said scheduling on-site verifications was inconsistent, ranging from the next day to three weeks. One trade ally found interactions with verifiers very helpful.

**Figure 4. Trade Ally Rating of Verifiers**



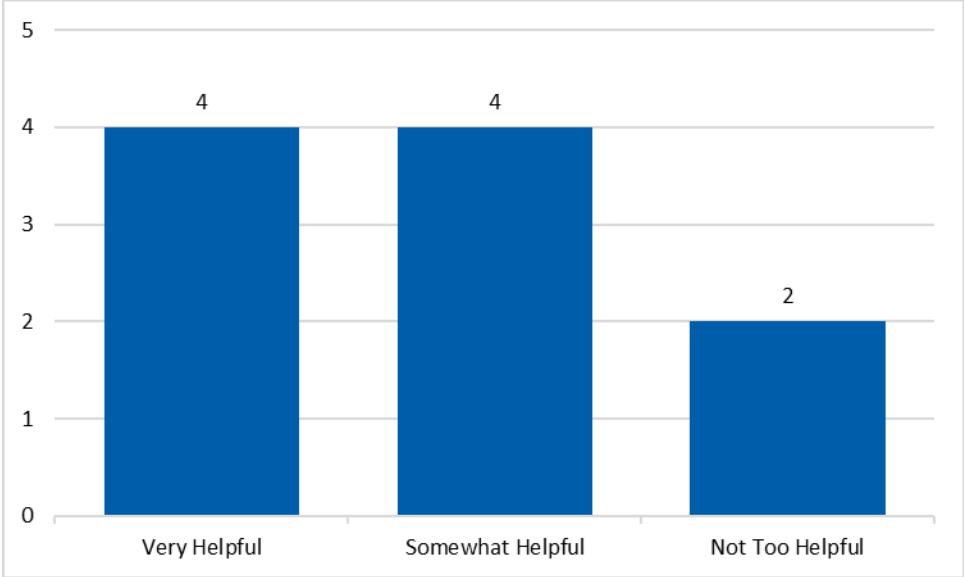
Source: Energy Trust Solar Electric Program—Verification Evaluation Trade Ally Interview Guide 2017 Question: 8.

As shown in Figure 5, trade allies found verifier feedback very or somewhat helpful, although they reported feedback tended to be vague and delivered through reports or emails that could be difficult to understand. Eight of the 10 trade allies working with multiple Energy Trust Solar Electric program verifiers found their feedback somewhat or not very consistent from one verifier to the next. One trade ally described this as each verifier having items they look for most often, but such items were not consistent between verifiers. Trade allies wanted more opportunities to discuss verifier’s concerns with an installation, and preferred specific recommendations on how Energy Trust wants corrections made.



One other challenge trade allies found time consuming to deal with was disruptions in the verification process due to new interpretations of code, and repeated and abrupt changes in elements verifiers look for without prior notice to trade allies.

**Figure 5. Helpfulness of Verifier Feedback (n=10)**

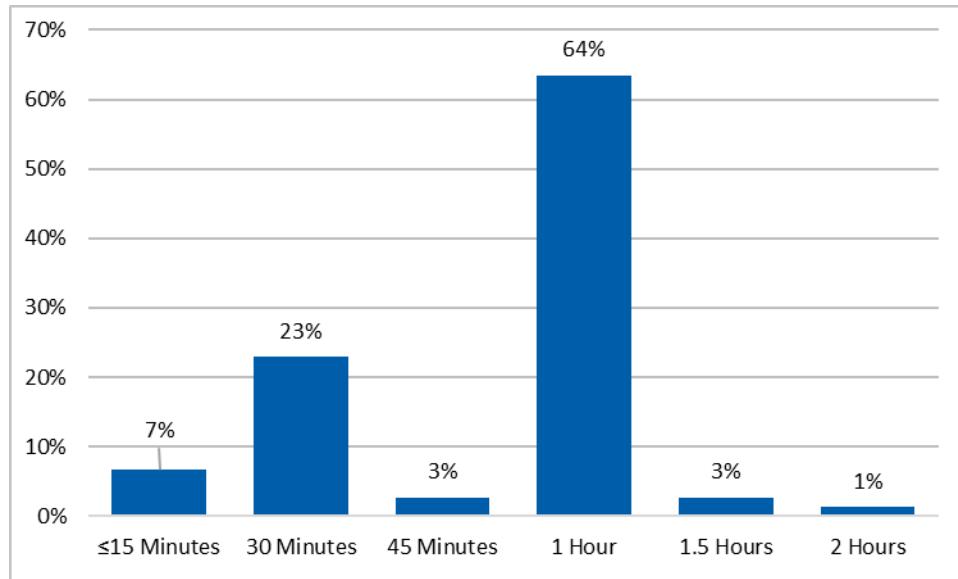


Source: Energy Trust Solar Electric Program—Verification Evaluation Trade Ally Interview Guide 2017 Question: 10.

**Participant Experience with Verification**

As remembered and described by participants, site verifications reflected a level of inconsistency in some aspects of the verification process. For example, although 92% of participants had system verifications completed in one visit (n=92), among participant recalling the site visit’s length (n=74), 89% required 30 to 60 minutes, while others required as long as two hours or as little as 15 minutes (Figure 6).

Figure 6. Participants' Estimate of Time to Complete Verification

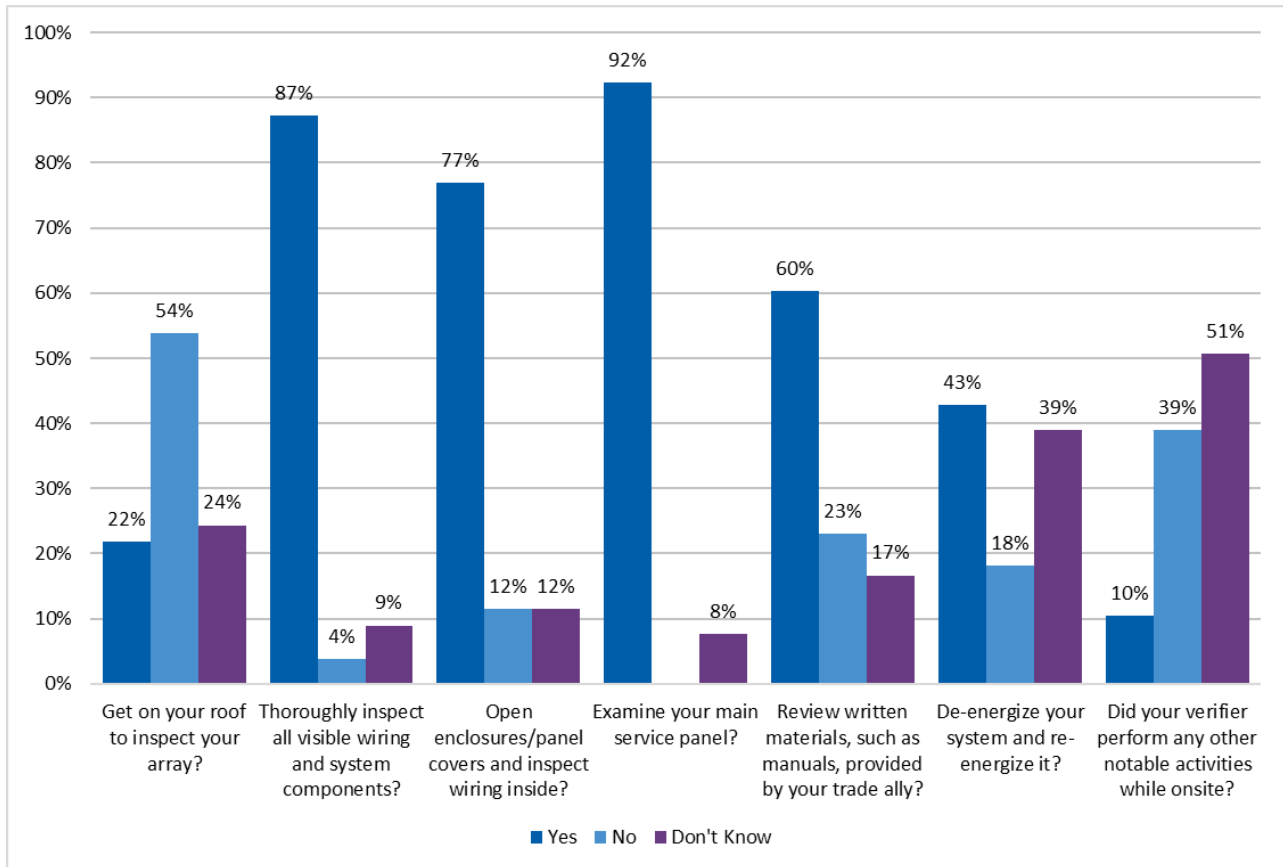


Source: Energy Trust Solar Electric Program—Verification Evaluation  
Participant Survey 2017 Question: C5. (n=74)

One other area of notable inconsistency is verifiers who accessed a customer's roof to inspect their solar array. As shown in Figure 7, 54% of participants reported that verifiers did not access their roof.



Figure 7. Participants’ Recall of Inspection Tasks Performed by Verifiers



Source: Energy Trust Solar Electric Program—Verification Evaluation Participant Survey 2017 Question: C9. (n=77)

### Program Design Support

Energy Trust periodically engages stakeholders, including verifiers, for input on their programs. Verifiers reported their willingness to continue supporting Energy Trust with services beyond the design reviews and verification services they currently focused on. Some verifiers welcomed more engagement with Energy Trust on program design topics. Of four verifiers, two indicated that Energy Trust came to rely on them less for program design and support tasks (such as developing installation requirements or guidance documents) than in previous years. At the same time, another verifier indicated they supplied sample documents and consulting for Energy Trust.

## 3. Solar Trade Ally Rating System

### Verification Results Reporting

The study found reporting verification results may lead to higher quality installations because of their impact on trade ally ratings. Though the solar trade ally rating process remains fairly new, each verifier reported noticing improvements since verification results began contributing to public-facing scores. In particular, verifiers noted a reduced incidence of minor installation issues, suspecting that trade allies

conducted their work a bit more carefully to avoid lowering their ratings. One verifier noted that the lead generation benefit was tied to maintaining a high rating score.

### Trade Ally Experience with the Solar Trade Ally Rating System

The solar trade ally rating system creates both value and concerns for trade allies, but it has had limited impacts on work processes. Trade allies reported mixed experiences with the system. Four trade allies felt the system benefitted their companies, providing a snapshot of their projects and any associated issues, or allowing trade allies and customers to better understand “where they stand” in relation to the competition.

One respondent cited the benefits of receiving quality sales leads from Energy Trust. Five trade allies reported receiving 10% to 30% of their leads from Energy Trust,<sup>4</sup> and four trade allies rated the value of these leads as a 4 on a 5-point scale, where 5 meant extremely valuable. The fifth trade ally did not provide a value rating.

One-half of the trade allies (representing ratings from 1.5 stars to 2.5 stars) expressed concerns about the system’s application, noting how difficult they found it to accrue points and how easily they could be deducted. These concerns included the following:

- Inconsistent application of standards across projects
- Trade ally focus on star ratings rather than projects or customers
- Concerns that ratings did not accurately reflect their company’s overall quality to customers
- Minor infractions on large projects carrying the same weight as those on small projects
- Difficulty in improving star ratings; points earned on “ten perfect projects” could be lost due to a mistake on a single project
- Time spent contesting and recovering deducted points
- Difficulties in duplicating the scoring applied by Energy Trust

Few trade allies acknowledged changing their work as a direct result of the rating system, although two reported changed quality control systems or increased vigilance on site, double-checking to assure they met Energy Trust’s standards. Several described an atmosphere of fear over “black and white” applications of Energy Trust standards, even though projects already passed municipal inspections.

Trade allies (rated 2 stars to 3 stars) can receive a percentage reimbursement of eligible cooperative marketing costs preapproved by Energy Trust. Six trade allies said they marketed themselves as Energy Trust solar trade allies through their marketing materials, proposals, conversations with customers, websites, and logos on clothing, newsletters, and literature. Of the four trade allies not marketing themselves as part of the program, one said they simply did not do much marketing; the other said they used to do such marketing, but the program now included too many contractors. All the trade allies

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<sup>4</sup> Respondents receiving leads from Energy Trust: 10% (n=2), 10%–15% (n=1), 20%–30% (n=1), 20% (n=1).



were unsure (n=2) or thought customers did not understand the rating system (n=8). One trade ally suggested people were more familiar with five-point rating systems instead of three.

### **Participant Awareness of Solar Trade Ally Rating System**

Eighty-seven percent of participants (n=97) reported they were not aware of Energy Trust’s solar trade ally rating system when selecting a trade ally to install their solar electric systems, which is not surprising given that the rating system was launched at around the same time as most of the participants’ installations took place. Of the participants that were not aware of the rating system, 68% (n=83) said Energy Trust providing a third-party rating system would have influenced their decision.<sup>5</sup> Of the remaining 13 participants who knew of the rating system, 12 rated its importance to their decision as a 4 or 5 (using a scale of 1 to 5, where 5 means very influential and 1 means not at all influential).

Participants used a variety of sources to identify trade allies from which to request project bids. Most frequently, participants identified trade allies through Energy Trust’s trade ally list or through recommendations from friends or colleagues. Less frequently, participants identified trade allies by conducting their own online searches, requesting a site analysis through Energy Trust’s website, or meeting trade ally representatives at home shows or trade shows.

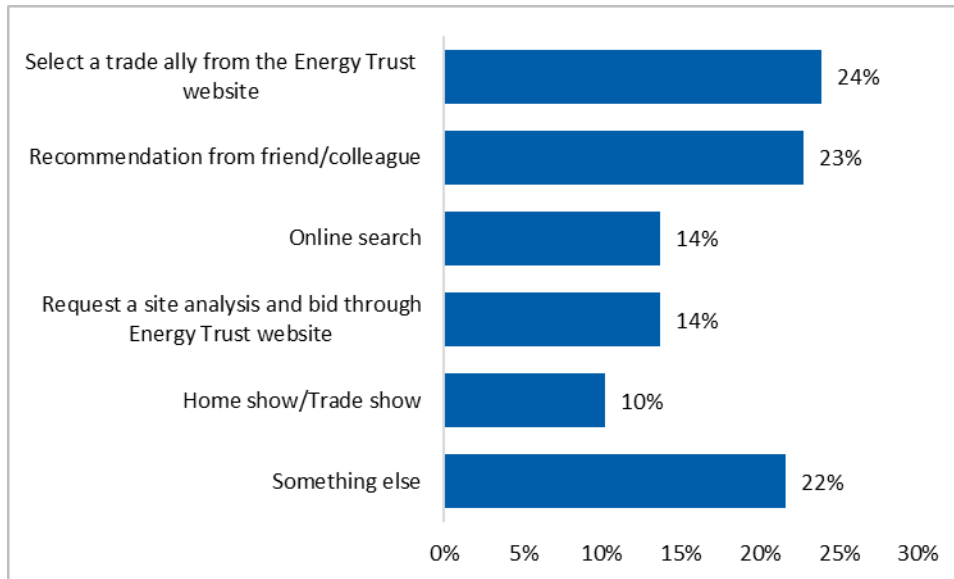
The “something else” category shown in Figure 8 included sources such as Home Depot displays, events at a local high school, contractor outreach, and prior experience. While some participants reported receiving five or six bids, the majority (54%, n=92), received one.<sup>6</sup>

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<sup>5</sup> Using a scale of 1 to 5, where 5 means a third-party rating system would be very influential and 1 means a third-party system would be not at all influential, 37% rated the influence as a 5, and 31% rated the influence as a 4.

<sup>6</sup> The percentage of participants reporting one or more bids: one bid=54%; two bids=25%; three bids=16%; five bids=3%; and six bids=1%. No participants reported receiving four bids.

Figure 8. How Participants Identified Trade Allies



Source: Energy Trust Solar Electric Program—Verification Evaluation Participant Survey 2017 Question: D3. (n=88) Multiple responses allowed.

### Winning Bid Selection

Among participants receiving only one bid, price was not the key factor they cited for moving forward with their bidder. Rather, they most frequently cited the estimated annual generation and the value of that energy, followed by a recommendation from another source (e.g., friend/family, colleague). Participants that received two or more bids reported price as their first reason, followed closely by the estimated annual generation and the value of that energy, and recommendations from another source.

Figure 9 shows all reasons given by participants. The “something else” category included the following: reviews from other program participants; the desire to select a local company; trade ally’s willingness to work with knowledgeable homeowners and provide upgrades or system features requested by the homeowner; component quality; and the trade ally’s reputation (or simply that the winning trade ally showed up and provided a bid when others did not).

While many participants reported price as one of the factors they considered when selecting their winning bidder, only three participants selected exclusively on price. Among participants not reporting price among their reasons for selecting a winning bid, 55% (n=31) said the bid they selected was also the lowest cost bid they received, however, 14 would have considered hiring a solar trade ally with a higher rating from Energy Trust, even if not the lowest bidder:

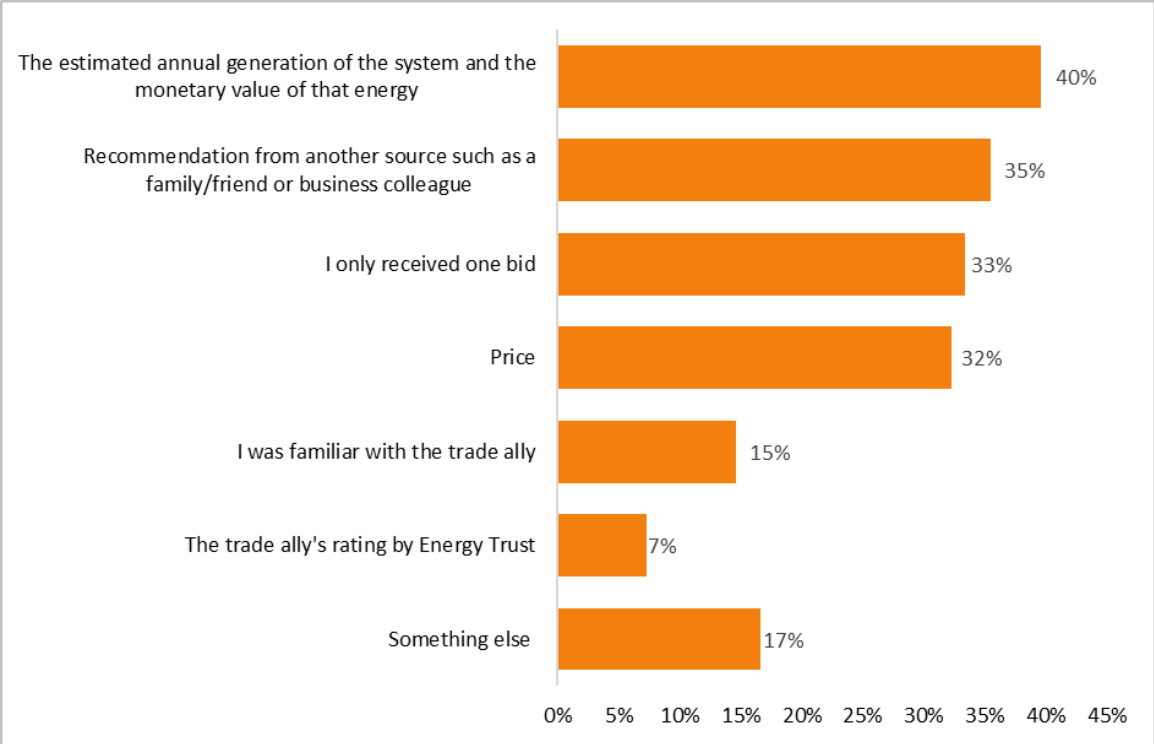
- If the price was within 5% (n=8)
- If the price was within 20% (n=1)
- Regardless of price (n=1)





- Other reasons (e.g., trade ally interviews and references; certainty of estimates for roof reinforcement; if all bids came from trade allies with three-star Energy Trust ratings) (n=4)

**Figure 9. Reasons Participants Selected their Winning Bid**



Source: Energy Trust Solar Electric Program—Verification Evaluation Participant Survey 2017  
 Question: E4. (n=96) Multiple responses allowed.

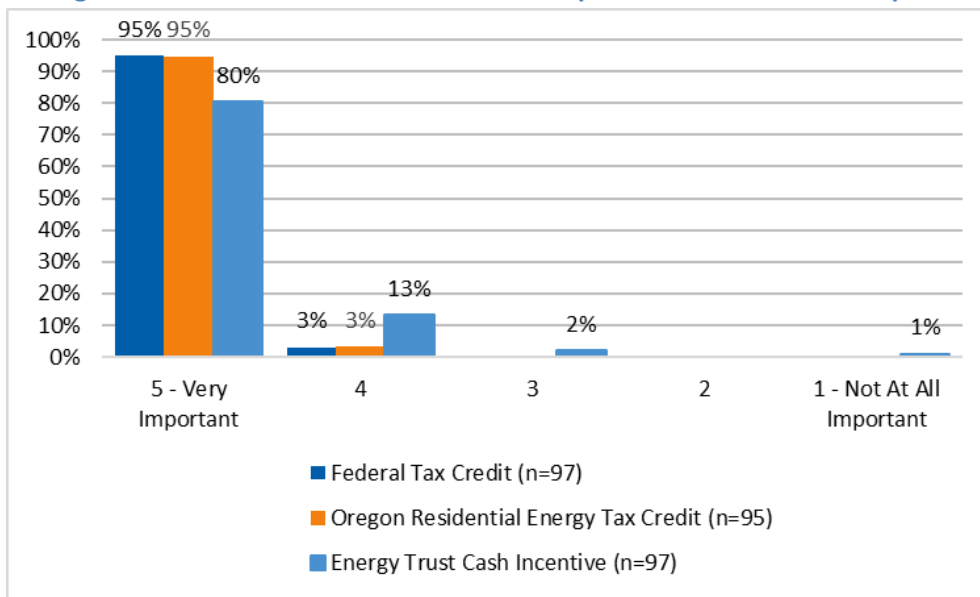
**4. Influence of Program Services and Financial Incentives**

**Incentive Influence**

Though incentives were highly influential in participants’ decisions to participate in the Solar Electric program, design reviews and installation verifications also proved important. As shown in Figure 10, participants overwhelmingly reported the tax credits and Energy Trust’s cash incentives as key to their decision to participate in the program and to install a solar electric system.

*“The Energy Trust incentive was a key influence in my decision to install a solar system. The Federal and State tax credits were also critical. If it was 2018 and the state tax credit and if the Energy Trust incentive goes away, then I would not choose to install a solar system. The return on investment will be too far out.”*

Figure 10. Influence of Incentives on Participants’ Decisions to Participate



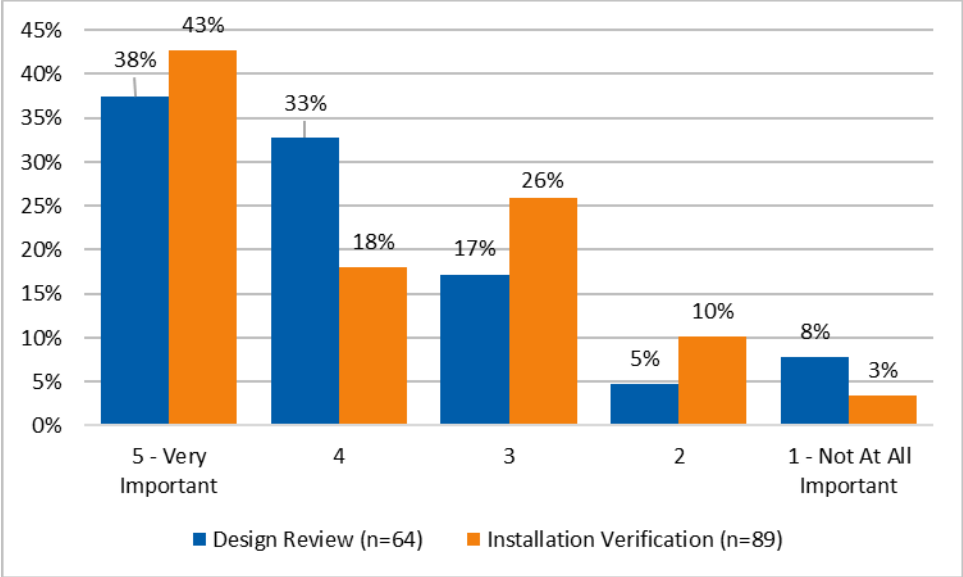
Source: Energy Trust Solar Electric Program—Verification Evaluation  
Participant Survey 2017 Question: F1.

Participants also rated Energy Trust’s design review and installation verification services as important to their decisions to participate in the program. Though, before participating, more participants knew of the verification than of the design review, on a scale of one to five (where five meant very important and one meant not at all important), 71% rated design review and 61% rated verification as 4 or 5.

As shown in Figure 11, approximately one-quarter of participants rated each service in the neutral range, with only 13% rating either service as being of low importance.



**Figure 11. Importance of Design Review and Installation Verification in Participants' Decision**

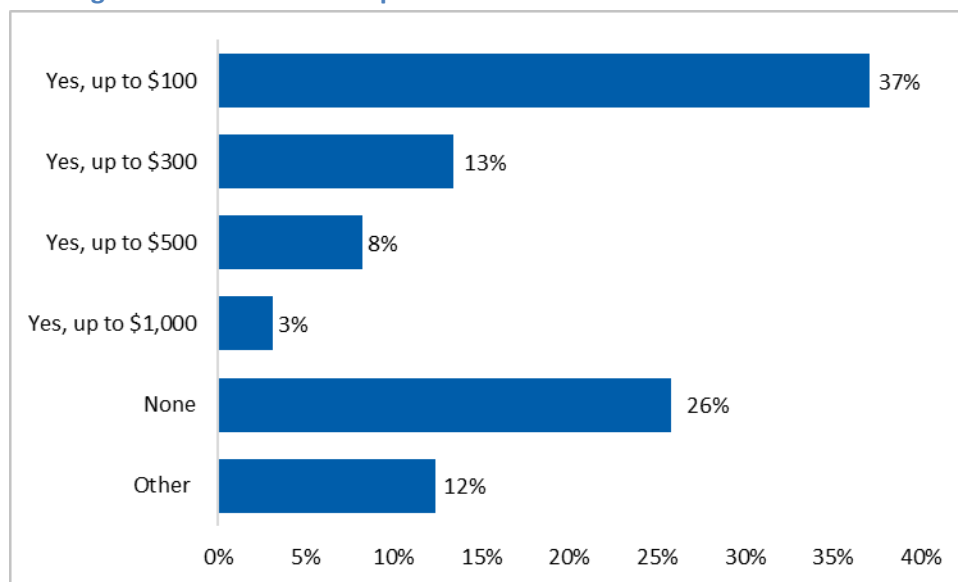


Source: Energy Trust Solar Electric Program—Verification Evaluation  
Participant Survey 2017 Questions: C2 and D2.

**Sharing Design and Review Costs**

Participants' willingness to share the cost of the design review and verification services declined for amounts above \$100 (see Figure 12). This \$100 represents approximately 10% to 30% of typical design review and verification costs. If Energy Trust could no longer pay incentives, but continued to provide design review and installation verification services, 37% of participants would be willing to pay up to \$100 dollars toward the cost, assuming trade allies or Energy Trust paid the remainder; 26% said they would not be willing to pay anything. Participants reporting "Other" produced similar results, saying their willingness to pay depended on the overall payback, including any tax incentives available at the time.

Figure 12. Amount Participants Would Contribute to Receive Services



Source: Energy Trust Solar Electric Program—Verification Evaluation Participant Survey 2017 Question: F2. (n=97).

### Multiple Roles for Energy Trust

In response to the December 31, 2017, sunset of Oregon’s Residential Energy Tax Credit for solar PV, trade allies have increased their focus on commercial customers and broadening their marketing to include potential customers in Washington State, changing their marketing messages to focus on locking-in long-term energy rates or looking for ways to reduce project costs.

Though trade allies praised Energy Trust’s existing marketing outreach and training, some offered recommendations for ways that Energy Trust could continue to help grow Oregon’s solar market:

- Educate the public through increased advertising, focusing on energy conservation and the ways that solar works
- Continue to provide sales leads (noting acquisition costs have quadrupled in past years)
- Develop financing options with local banks
- Lobby for new incentives<sup>7</sup>
- Assist in standardizing permitting across Oregon to educate municipal inspectors

<sup>7</sup> Note: Energy Trust is specifically prohibited from lobbying by its grant agreement with the Oregon Public Utility Commission.

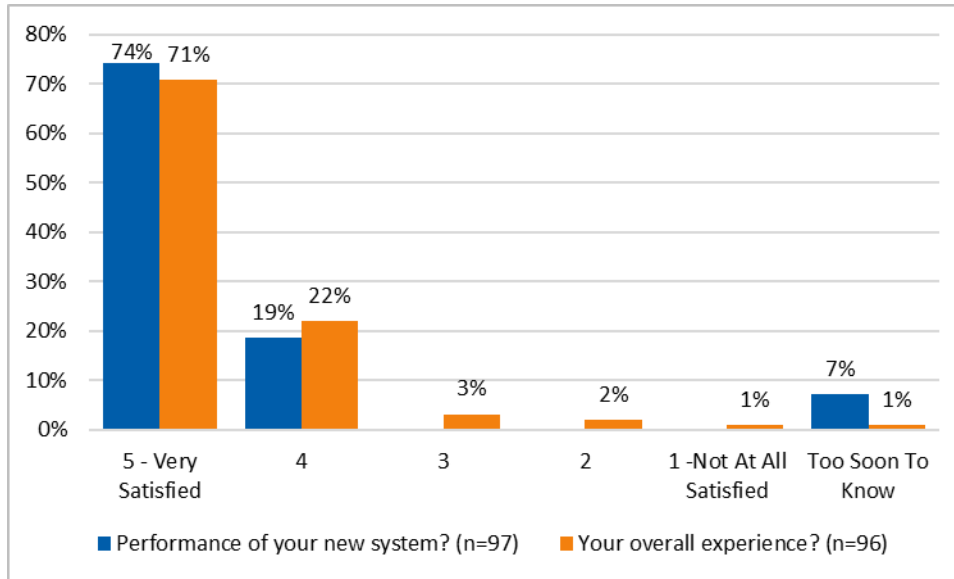
## 5. Participant Satisfaction

### Solar Electric System Performance

As shown in Figure 13, participants were very satisfied with the performance of their solar electric systems and their overall experience with the program.

*“You guys [Energy Trust] were amazing, and I really appreciate you working with [my electrician].”*

Figure 13. Participant Satisfaction with System Performance and Overall Experience



Source: Energy Trust Solar Electric Program—Verification Evaluation Participant Survey 2017 Question: F3

Eleven participants offered suggestions for Energy Trust to improve the Solar Electric program, with the following representative of their responses:

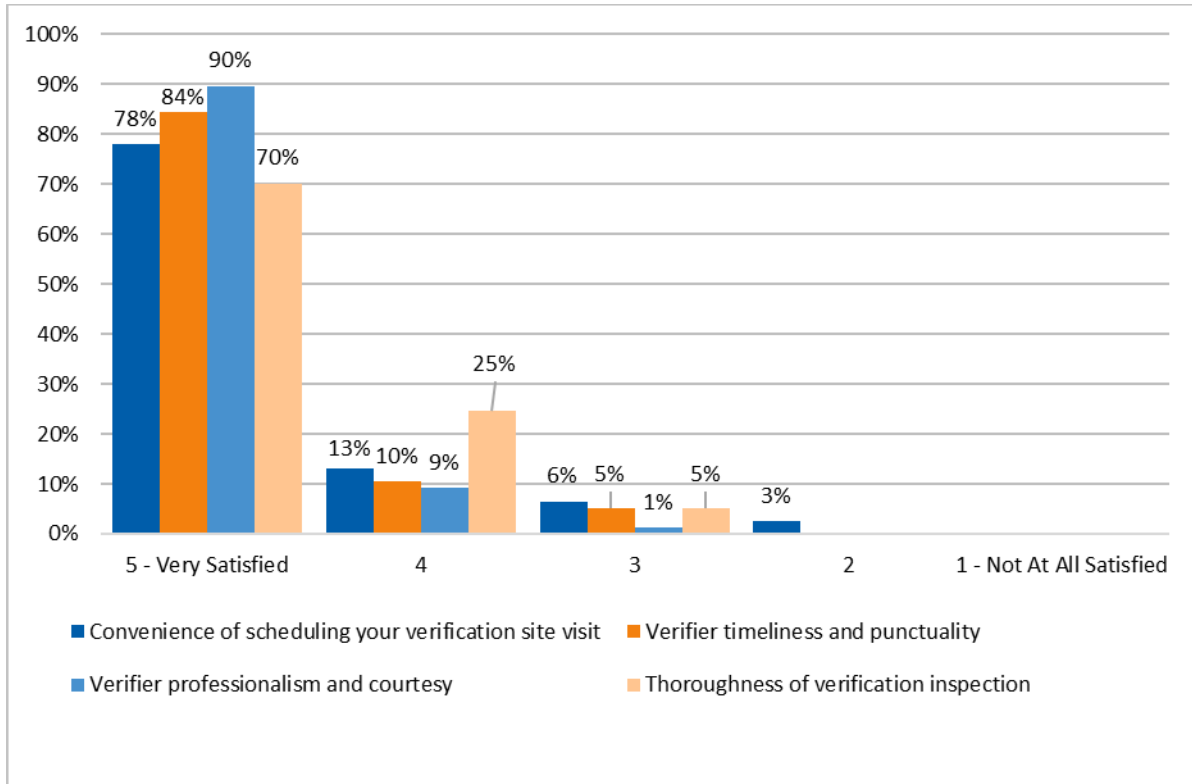
- Provide better communication on the status of corrections and incentives
- Increase efforts to educate the public about energy credits, including how they are used, and to encourage the public to consider the viability of solar for their homes
- Work with Portland General Electric to remove barriers and to accelerate their roles in the program
- Seven respondents took the opportunity to compliment Energy Trust’s program.

### Satisfaction with Verifiers

Participants expressed strong satisfaction with the verifiers: 80% of participants (n=96) interacted with their verifiers during site visits and reported high satisfaction levels with them. Figure 14 illustrates participant satisfaction with the convenience of scheduling, verifier timeliness and professionalism, and the verification’s thoroughness. Participants indicated slightly lower satisfaction levels with verifier thoroughness—25% of participants rating thoroughness at 4 rather than 5. Cadmus found no

correlation between participants’ satisfaction ratings of verifier thoroughness, and the number of site visits required, or the verifier’s time on-site. One verifier received only satisfaction ratings of five-very satisfied, in all four categories.

Figure 14. Participant Satisfaction with Verifiers



Source: Energy Trust Solar Electric Program—Verification Evaluation  
Participant Survey 2017 Question: C7. (n=77)

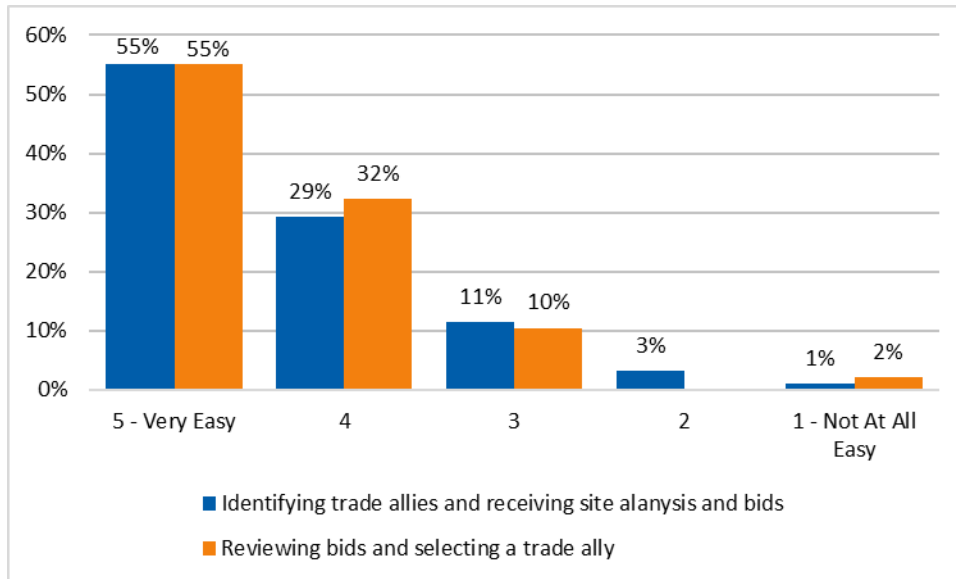
**Ease of Process**

Participants generally expressed satisfaction with the process of identifying trade allies, receiving bids, reviewing bids, and selecting a trade ally to install their solar electric systems.

A small percentage expressed challenges in acquiring bids and selecting a trade ally. These included a few trade allies that failed to show up for appointments, quickly dismissed a site as inappropriate for solar, or responded slowly after signing a contract. While these participants found trade allies to complete their solar electric projects, one changed trade allies after signing the original contact and before their project could be successfully installed. Figure 15 shows participants’ ratings for each task.



Figure 15. Ease of Identifying and Selecting a Trade Ally



Source: Energy Trust Solar Electric Program—Verification Evaluation Participant Survey 2017 Question: D5 and D7. (n=96)

Following selection of a trade ally, 73% of participants (n=97) did not encounter issues with the trade ally installing their system. Another 27% described challenges during the installation period, though not all of these were issues with trade allies, and two participants described how professional and diligent trade allies were in resolving their issues. Challenges included the following:

- Installation issues (e.g., solar panel placement mistakes, electric panel labeling errors, the need to repeat steps multiple times to complete them correctly, incorrect billing, and too few solar panels) (seven respondents)
- Delayed permits and inspections by utilities or city inspectors (four respondents)
- Overbooked trade allies, non-performing trade allies, or electricians (three respondents)
- Misunderstandings of how the system would work (three respondents)
- Property damage (two respondents)
- Other (five respondents)

## 6. Remote Verification

### Optimism about the Remote Verification

Verifiers generally expressed optimism about remote verification, though some verifiers indicated initial skepticism regarding the process. All reported finding the proposed process and photo collection tool compelling. The verifiers indicated they expected the new process to help improve trade ally installation practices, though they were less certain regarding how the process would replace or supplement the current process. In all cases, they recommended completing at least a random sample of on-site

verifications to ensure remote verification results were reported accurately. One verifier was particularly adamant that trade allies caught submitting false information through the remote verification process should face stiff penalties from Energy Trust.

### Site Capture Participants

Trade allies participating in the test of Site Capture for remote verification favored remote verification; others remained in wait-and-see mode.<sup>8</sup>

Eight trade allies were aware Energy Trust was piloting a remote verification process, with three of the eight currently participating. The three participating trade allies expressed very positive sentiments about their experience, noting aspects such as Site Capture would prove faster for the verifiers, provided a good photo checklist of installations, and should continue.

Participating trade allies, however, also described process impacts that indicated remote verification did not currently speed things up. Their primary concerns included the number of photos requested and the additional time and paperwork required. One said they uploaded 43 to 50 photos per project, which they thought were too many, somewhat redundant, and some (e.g., open panels) required an electrician with proper personal protection equipment to take the photo. Additionally, this trade ally said the photos already answered some entries that had to be typed in. Another of the three participants saying the process required an additional 15 minutes for the person in the office, and 30 to 40 minutes for field staff on site: it required “a LOT of paperwork”. The third participant had to purchase additional tools, but did not describe those purchased.

Four of the eight trade allies knowing of the pilot but not participating thought Site Capture would potentially be helpful to provide another level of quality control or to save time and speed the process.

Overall, trade allies expressed a wait-and-see attitude to remote verification, saying it could “keep installers honest,” improve documentation procedures, speed and simplify the process (requiring less time from the homeowners), improve internal quality control, and increase cost savings, particularly for less complex projects and if Energy Trust establishes clear expectations. Some trade allies expressed reservations about using this for more complex projects or the process creating too much work and more back-and-forth with Energy Trust, and noting the diminishing returns created by more work in conjunction with lower incentives.

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<sup>8</sup> Site Capture is an online tool for capturing photographs and other field observations. More information can be found at <https://www.sitecapture.com/>.





## 7. Trade Ally Tools

### PowerClerk

Trade allies expressed generally positive opinions about PowerClerk, the web-based tool used to submit solar electric program applications, specifically noting the following:

- They liked features such as the dropdowns, e-signature, and that applications for Energy Trust and the state were the same
- It saved time on data entry
- It also could be used for several other utilities

More troublesome features included the system operating slowly when updating inverters and when using the Total Solar Resource Fraction (TSRF), difficulties in separating qualifying arrays from non-qualifying arrays when only a percentage of a particular array qualified, and the time required to learn the system. One trade ally simply said it was difficult to use and not helpful.

### Remote Shade Tools

Respondents found remote shade tools generally useful, but not accurate enough to replace on-site data collection. Cadmus asked trade allies about their use of remote solar resource analysis tools. While eight trade allies used remote shade tools, their responses were mixed regarding their usefulness. Trade allies using these tools appeared to use them as initial screening tools or to generate pricing, but they relied on on-site data for accuracy, particularly for projects falling between 75%–80%.

Of 10 trade allies, five used on-site data collected with Aurora, three used Helioscope, and two used SunEye. One-half of trade allies said these remote tools were not always accurate enough to help them qualify potential solar customers, they still go onsite.

## 8. Value of the Verification Program

Overall, Energy Trust’s solar electric verification process benefits the solar electric industry and participants in a number of ways. While the program has room to tighten-up and streamline its verification process, results from this evaluation indicate trade allies are responding to Energy Trust’s influence in the market. Cadmus found evidence that Energy Trust’s verification program is:

- Raising the quality of solar electric installations
- Improving trade ally knowledge and installation practices
- Improving trade ally project documentation practices
- Increasing customer understanding of the value of design review and verification

The verification process is also supporting Energy Trust staff by increasing staff confidence in trade allies’ installations and freeing up limited staff for performing other administrative duties associated with the solar electric program.

## Participant Benefits

Though participants did not address the program’s value directly, they addressed the importance of verification program components, including willingness to contribute to the cost of acquiring services.

## Trade Allies Benefits

Trade allies benefitted from program participation, although, some found the process more burdensome than those of similar programs offered through utilities. The majority of trade allies (6 of 10) described the following benefits from program participation:

- Keeping their installers “a little more honest” knowing an Energy Trust verifier will visit the site
- Oregon’s reputation for high-quality solar electric installations due to third-party verification
- Client confidence resulting from third-party verification
- Identification of issues missed by trade allies’ internal quality control processes
- Education provided by Energy Trust and verifiers

While trade allies benefited from the program, six trade allies (including both those who reported benefits and those that reported no benefits), also described the verification process a frustrating hurdle that can slow the process, with verifiers “nitpicking” installations and reporting inconsequential issues.

Trade allies working with other Oregon or Washington utilities’ solar programs (5 of 10) reported those programs as less restrictive, less time consuming, and less costly, but also reported not having to meet standards such as those established by Energy Trust. While trade allies said they worked hard to comply with Energy Trust’s standards, some questioned the need for some of those standards. One trade ally reported the process posed “a lot of hoops to jump through,” requiring a great deal of time and effort. “It is worth it, but, wow: the entire process is thorough.”

## Trade Ally Suggestions for Verification Process Improvement

Trade allies’ suggestions for improving the verification process generally fell into three categories discussed below: operational, communication, and timeframes.

### Operational Improvements

- Apply rules consistently and transparently
- Scale the star rating system to reflect a project’s size (e.g., “A loose fitting on a megawatt project doesn’t equal a loose fitting on a small project”)
- Keep Site Capture input fields to a minimum
- Eliminate on-site verifications

One trade ally suggested that Energy Trust consider convening a technical review panel to determine if its standards aligned with best practices, noting some standards increased cost but might not affect installation quality.



### **Communication Improvements**

- Increase verifier availability to trade allies, allowing more back-and-forth conversations with verifiers regarding standards interpretations

### **Timeframe Improvements**

- Establish timelines for program staff or trade ally feedback; review Site Capture information within a specified number of days
- Process incentive payments more quickly upon completing verification (“Sometimes the entire profit is in that payment”)

### **Quantification of Verification Process**

Possible methods of quantification for the value of the verification process include:

- Reduction in maintenance costs
- Reduction in catastrophic failures
- Use the average of what customers would pay, multiplied by the number of customers in one year

Quantifying the value of the verification process presents several challenges, as the benefits tend to be indirect, while the costs of verification are relatively easy to quantify. Nevertheless, in order to fully quantify the benefits that verification provides to the industry, Energy Trust would need to assess the cost savings associated with a reduced number of unscheduled maintenance events. If trade allies are making more robust design and installation choices as a result of the program, that would result in reduced lifetime costs for the system owner and/or trade ally. For example, exercising proper wire management and using longer lasting stainless-steel cable clamps for rooftop array wire management could reduce the chances of having to replace conductors that are damaged by pests or exposure to abrasive surfaces. The challenge, however, is that such a failure may not occur in every case and, when it does, will likely occur several years after installation—a point at which Energy Trust currently captures little data compared to the data collected during and shortly after the installation process is complete.

A full evaluation quantifying the monetary benefits of the verification process would likely require a technical review of older installations’ failure rates and operating/maintenance costs, comparing similar projects that received verification and those that did not receive verification. Since Energy Trust’s verification rate is 100%, identifying a control group of similar projects that have not had verifications done would be a challenge.

Another metric is to quantify what customers perceive the value of the verification process to be, and using that as a direct benefit. The figures derived from this study are an indicator of where those values may lie, but further research should be undertaken with a larger sample and a deeper breadth to achieve a more accurate assessment of this value.

Overall, quantifying the benefits of increased quality has posed a challenge to the PV industry. While some trade allies and installation companies are embracing high quality as a business objective, even

these firms have not necessarily established a clear monetary business case for doing so. This may be an area of future research where Energy Trust can make further meaningful contributions to the PV industry.



## Conclusions and Recommendations

### Conclusions

Cadmus found that the verification process is adding substantial value to the Oregon solar industry. Positive impacts of the verification process include:

- **Improved Installation Quality:** Over the last several years, the issues found onsite during the verification process have decreased. For example, in 2015 approximately 28% of sites had issues found during onsite verification, compared with only 20% in 2017 (see Section 1).
- **Providing a Positive Customer Experience:** Ninety-three percent of program participants expressed a high degree of satisfaction with their overall experience, including their experience with the verifiers (e.g., professionalism, timeliness, thoroughness, ease of scheduling), and the ease of identifying and selecting a trade ally (see Section 5).
- **Public Reporting of Verification Results is Important to Participants:** The study found reporting verification results may lead to fewer installation issues. Though the solar trade ally rating process remains fairly new, each verifier reported noticing improvements in installation quality since verification results began contributing to public-facing ratings. In particular, verifiers noted a reduced incidence of minor installation issues, suspecting that trade allies conducted their work a bit more carefully to avoid lowering their ratings (see Section 3).
- **Verifiers Provide a Valuable Service to Participants and Trade Allies:** Though most customers would not be willing to procure third-party verification services on their own, a majority did indicate that these services had a tangible value that they would be willing to pay something for (see Section 3). In addition, the majority of trade allies (6 out of 10) reported benefits relating to improving installer diligence and broad benefits to the reputation of the regional solar industry attributable to the verification process (see Section 8).

The evaluation noted several additional conclusions:

- Energy Trust's incentives in conjunction with tax credits, and design review, are positive determining factors in participants installing solar electric systems (see Section 4).
- Energy Trust has made progress on the working relationship between trade allies and verifiers, but there are still some issues with trade allies having sufficient access (e.g., getting timely responses to questions) to verifiers (see Section 5).
- Remote verification, a method of verification using pictures and other information thereby allowing review without being on-site, can gain additional trade ally acceptance if it not overly burdensome in time and cost (see Section 6).
- Opportunity exists to reduce trade ally costs and streamline verification processes by reviewing Energy Trust standards against industry best practices, to identify any standards that are unnecessary (see Section 8).
- There are some issues on consistency and communication between verifiers, likely due to verifiers' high workload for project field verifications (see Section 2).

## Recommendations

Though the overall process appears to be providing value to the industry, Cadmus identified several opportunities to improve the verification process, including:

- **Increase verifier consistency.** In discussing the verification process with verifiers, Cadmus noted that there are substantial differences in how verifiers conduct their work. For example, verifiers provided variable responses about time spent onsite, necessity of accessing rooftop equipment, and how frequently the verifier might open and inspect enclosures containing wiring for PV system equipment. Trade allies also expressed frustration at the variability between verifiers. Energy Trust may consider steps to standardize the level of verification rigor between verifiers.
- **Increase the number of verifiers or accelerate remote verification.** If Energy Trust intends to continue with the same level of verification, they may need to increase the number of verifiers or accelerate remote verification to reduce heavy workloads and minimize delays (by the conclusion of this report, the number of verifiers had decreased). If, however, Energy Trust sees a persistent decline in applications as a result of the discontinuation of the Residential Energy Tax Credits, Energy Trust may want to delay adding new verifiers until applications return to levels seen during this evaluation.
- **Identify specific inputs required from trade allies and minimize additional requests.** Too much additional work required of trade allies erases the marginal value of the incentives. Energy Trust should consider convening a focus group of trade allies to discuss modifications to requirements and standards that all parties may find an agreeable balance to provide the necessary information for verification without undue strain.

In addition to the existing verification process, roll-out of the remote verification process should continue.

- **Continue pursuing remote verification.** Remote verification is beginning to show promise but is not yet established. It is generally accepted by trade allies and has the potential for large cost and time savings for Energy Trust verifiers.



## Appendix A. Interview Guides

**Energy Trust Solar Electric Program—Verification Evaluation  
Participant Survey 2017**

| Researchable Questions   | Item             |
|--|------------------|
| Introduction and screening   | Sections A and B |
| Were customers aware of the design review and installation verification provided by Energy Trust at the time they decided to participate? How influential were those services in their decision? | C1,C2,D1,D2      |
| Verification process   | Section C        |
| How do participants interact with verifiers? How much time does it require?  | C3-C6, C8-C10    |
| Design, Analysis and Bid   | Section D        |
| How did participants identify trade allies? How easy was the process of requesting and receiving the site analysis and bid?  | Section D3-D6    |
| How easy was the process of reviewing the bid and selecting a trade ally?  | D7,D8            |
| Solar Trade Ally Rating System   | Section E        |
| Are customers aware of the solar trade ally rating system? Was it influential in their selection of a trade ally?  | E1-E6            |
| Financial Incentives and Satisfaction  | Section F        |
| How important are program elements on participant decision making?   | C2,D2,0,E3,F1    |
| What challenges or barriers do participants experience with the program?   | D6,D8, E7,F4,    |
| How satisfied are customers?   | C7,F3, F4        |
| What improvements would participants recommend for the verification process?   | F5               |





**A. Introduction**

- A1. Thank you for participating in this Energy Trust survey to better understand our customer’s experience with our Solar Electric Program. Your perspective is important to us; we appreciate your time and thoughts. This should take approximately 15 minutes. Your responses will be used for research purposes only and will not be identified with any individual or company. Once you submit the completed survey, your name will be entered into a drawing for a \$100 gift card.
- A2. First, let’s be sure you are eligible to complete the survey.

**B. Screeners**

- B1. Our records show that you recently installed a solar electric system. Is this correct?
  - 1. Yes
  - 2. No **[SKIP TO B4]**
  - 98. Don’t know **[SKIP TO B4]**
- B2. Are you familiar with the activities that occurred at your **[INSERT PROGRAMB OR TRACK B,]** during the design and installation of the project?
  - 1. Yes
  - 2. No **[SKIP TO B4 ]**
- B3. Are you familiar with the project verification conducted by energy trust?
  - 1. Yes **[SKIP TO B5]**
  - 2. No **[GO TO B4 ]**
- B4. Thank you for your time, we have no further questions for you today.
- B5. Thank you. You qualify for the survey, please proceed to the next question.

## C. Verification Process

- C1. Let's begin by discussing the verification energy trust conducted on your solar electric system. When you began the process to install your system, were you aware that energy trust would perform a verification site visit of the project to ensure your system meets energy trust standards, after it was completed?
1. Yes
  2. No **[SKIP TO C3]**

- C2. Using a five-point scale where five is very important and one is not at all important, how would you rate the importance of this verification to your decision to participate in energy trust's solar electric program?

| Element |  | 5 - Very Important | 4 | 3 | 2 | 1 - Not at all Important |
|---------|--|--------------------|---|---|---|--------------------------|
| A       | Importance of the installation verification to your decision to participate? |                    |   |   |   |                          |

- C3. Following the installation of your solar electric system, did you schedule the Energy Trust verification appointment, or was that done by your trade ally (the person who installed your system), or someone else?
1. I scheduled it
  2. My trade ally scheduled it
  3. Someone else. (Who scheduled the verification appointment?) **[TEXT BOX]**
  4. **NO ONE FROM ENERGY TRUST INSPECTED MY SYSTEM**
  98. Don't know
- C4. **[IF C3=1, 2, 3, OR 98]** Did the Energy Trust verifier have to visit your site more than once, to complete the verification?
1. Yes
  2. No
  98. Don't know
- C5. **[IF C3=1, 2, 3, OR 98]** Approximately how long did the verifier spend at your site completing the verification? Please estimate in hours, the total time for all visits if the verifier had to return to your site. **[TEXT BOX]**
- C6. **[IF C3=1, 2, 3, OR 98]** Did you interact with the Energy Trust verifier during the verification site visit?
1. Yes



2. No **[SKIP TO D1]**

C7. Thinking about your experience with your Energy Trust verifier, please indicate the number that corresponds to your satisfaction with the following service elements.

| Element |  | 5 - Very Satisfied | 4 | 3 | 2 | 1 - Not at all Satisfied | Not applicable |
|---------|--|--------------------|---|---|---|--------------------------|----------------|
| A       | Convenience of scheduling your verification site visit |                    |   |   |   |                          |                |
| B       | Verifier timeliness and punctuality                    |                    |   |   |   |                          |                |
| C       | Verifier professionalism and courtesy                  |                    |   |   |   |                          |                |
| D       | Thoroughness of verification inspection                |                    |   |   |   |                          |                |

C8. **[IF C7.A, B, C, OR D=1 OR 2]** Your rating indicates you were less than satisfied with at least one of the service elements. So that we may improve the process, please tell us why you selected this rating.

- A1a. Convenience of scheduling your verification site visit **[TEXT BOX]**
- A1b. Verifier timeliness and punctuality **[TEXT BOX]**
- A1c. Verifier professionalism and courtesy **[TEXT BOX]**
- A1d. Thoroughness of verification inspection **[TEXT BOX]**

C9. During your verification site visit, did your verifier perform these activities?

| Activity |   | Yes | No | Don't Know |
|----------|---|-----|----|------------|
| A        | Get on your roof to inspect your array?                                 |     |    |            |
| B        | Thoroughly inspect all visible wiring and system components?            |     |    |            |
| C        | Open enclosures/panel covers and inspect wiring inside?                 |     |    |            |
| D        | Examine your main service panel?  |     |    |            |
| E        | Review written materials, such as manuals, provided by your trade ally? |     |    |            |
| F        | De-energize your system and re-energize it?                             |     |    |            |
| G        | Did your verifier perform any other notable activities while onsite?    |     |    |            |

C9a. **[IF C9.G=YES]** What other notable activities did the verifier perform while onsite? **[TEXT BOX]**

C10. While onsite, did the verifier answer all your questions?

1. Yes
2. No
3. I did not ask the verifier any questions.

### **D. Design, Analysis and Bid**

D1. Thank you. Now thinking back to when you were first planning to install your solar electric system, were you aware that energy trust would review the system design to ensure your system met energy trust standards?

1. Yes
2. No **[SKIP TO D3]**

D2. Using a five-point scale where five is very important and one is not at all important, how would you rate the importance of the design review to your decision to participate in energy trust's solar electric program?

| Element |  | 5 - Very Important | 4 | 3 | 2 | 1 - Not at all Important |
|---------|--|--------------------|---|---|---|--------------------------|
| A       | Importance of the design review to your decision to participate? |                    |   |   |   |                          |



D3. Before you installed your solar electric system, you had to select a trade ally to analyze your site and provide a bid. How did you identify the trade allies to provide the analyses and bids for your project? Did you...? **[SELECT ALL THAT APPLY]**

- 1. Request a site analysis and bid through Energy Trust’s website
- 2. Select a trade ally from the list provided on Energy Trust’s website and contact them directly
- 3. Something else **[TEXT BOX]**
- 98. Don’t know

D4. How many bids did you receive to install solar on your **[INSERT PROGRAM B OR TRACK B]**?

- 1. **[TEXT BOX]**
- 98. Don’t know

D5. How would you rate the overall ease of identifying trade allies and receiving your site analyses and project bids?

| Element |  | 5 - Very Easy | 4 | 3 | 2 | 1 - Not at all Easy |
|---------|--|---------------|---|---|---|---------------------|
| A       | Ease of identifying trade allies and receiving site analyses and project bids? |               |   |   |   |                     |

D6. **[IF 0.A=1 OR 2]** Your rating indicates you found identifying trade allies and receiving your site analyses and bids, not very easy. So that we may improve the process, please tell us more about what was challenging. **[TEXT BOX]**

D7. After you received your bids, how would you rate the ease of **reviewing** the bids and **selecting** your trade ally to install your solar electric system?

| Element |  | 5 - Very Easy | 4 | 3 | 2 | 1 - Not at all Easy |
|---------|--|---------------|---|---|---|---------------------|
| A       | Ease of reviewing your bids and selecting a trade ally for your project? |               |   |   |   |                     |

D8. **[IF D7.A=1 OR 2]** Your rating indicates you found reviewing the bids and selecting a trade ally to install your system, not very easy. So that we may improve the process, please tell us more about what was challenging. **[TEXT BOX]**

**E. Solar Trade Ally Rating System**

These next questions will ask your opinion of Energy Trust’s solar trade ally rating system. The trade ally is the person that installed your solar electric system.

E1. In 2017, Energy Trust implemented a new rating system for its solar trade allies that can be found on the Energy Trust website. This system rates trade allies from one to three stars on their customer service, installation quality, and system design. Were you aware of the Energy Trust ratings when you selected your trade ally?

1. Yes
2. No **[SKIP TO E3]**

E2. Using a five-point scale where five is very influential and one is not at all influential, how influential was the Energy Trust solar trade ally rating in your selection of your trade ally? **[ALLOW RESPONSE THEN SKIP TO E4]**

| Element |  | 5 - Very Influential | 4 | 3 | 2 | 1 - Not at all Influential |
|---------|--|----------------------|---|---|---|----------------------------|
| A       | Influence of Energy Trust trade ally rating system on your trade ally selection? |                      |   |   |   |                            |

E3. **[IF E1=2]** Using a five-point scale where five is very influential and one is not at all influential, how influential would a public third-party rating by Energy Trust of trade ally customer service, installation quality, and system design be in your decision?

| Element |  | 5 - Very Influential | 4 | 3 | 2 | 1 - Not at all Influential |
|---------|--|----------------------|---|---|---|----------------------------|
| A       | Influence of a public third-party rating by Energy Trust, of trade ally customer service, installation quality, and system design, on your trade ally selection? |                      |   |   |   |                            |

E4. Why did you select the bid you moved forward with? **[SELECT ALL THAT APPLY]**

1. Price
2. The trade ally's rating by energy trust
3. The estimated annual generation of the system and the monetary value of that energy
4. I was familiar with the trade ally
5. Recommendation from another source such as a family/friend or business colleague
6. I only received one bid
7. Something else **[TEXT BOX]**

E5. **[IF E4=1]** Was the bid you selected the lowest cost of all bids you received?

1. Yes
2. No



- E6. **[IF E5=1]** Would you have considered hiring a solar trade ally with a higher rating from Energy Trust, even if they were not the lowest bidder for your solar electric project?
1. Yes, if the price was within 5%
  2. Yes, if the price was within 20%
  3. Yes, regardless of price
  4. No, I would go with the lowest bidder regardless of an Energy Trust trade ally rating
  5. Other **[TEXT BOX]**
  98. Don't know

- E7. At any point during the installation of your solar electric system, did you encounter any issues with the trade ally that installed your system?
1. Yes. What issues did you encounter? **[TEXT BOX]**
  2. No

**F. Financial Incentives and Satisfaction**

Thank you. We have only a few remaining questions to complete the survey.

- F1. Currently, various financial incentives, deductions and tax credits are available for solar electric installations. Using a five-point scale where five is very important and one is not at all important, please rate the importance of each, on your decision to proceed with your project. If you were unaware of one financial opportunity or it does not apply to you, please select NA.

| Financial Incentive |  | 5 - Very Important | 4 | 3 | 2 | 1 - Not at all Important | NA |
|---------------------|--|--------------------|---|---|---|--------------------------|----|
| A                   | Energy Trust Cash Incentive?   |                    |   |   |   |                          |    |
| B                   | Federal Tax Credit?  |                    |   |   |   |                          |    |
| C                   | <b>[PROGRAM B OR TRACK B BUSINESS CUSTOMERS ONLY]</b><br>Federal Accelerated Depreciation? |                    |   |   |   |                          |    |
| D                   | <b>[PROGRAM B OR TRACK B HOME CUSTOMERS ONLY]</b><br>Oregon Residential Energy Tax Credit? |                    |   |   |   |                          |    |

F2. At some future point, Energy Trust may no longer be able to offer cash incentives for the installation of solar electric systems. If energy trust no longer paid an incentive, but still provided the design review and installation verification, would you consider paying a portion of the cost for the design review and verification services, if the remainder were paid by Energy Trust and/or your trade ally?

1. Yes, up to \$100
2. Yes, up to \$300
3. Yes, up to \$500
4. Yes, up to \$1,000
5. No
6. Other **[TEXT BOX]**

F3. Your satisfaction is very important to Energy Trust; please rate your satisfaction with each of the following elements.

| Element |                                 | 5 - Very Satisfied | 4 | 3 | 2 | 1 - Not at all Satisfied | Too soon to know. |
|---------|---------------------------------|--------------------|---|---|---|--------------------------|-------------------|
| A       | Performance of your new system? |                    |   |   |   |                          |                   |
| B       | Your overall experience?        |                    |   |   |   |                          |                   |

F4. **[IF F3.A OR B=1 OR 2]** Your rating indicates you were less than satisfied with **[INSERT ELEMENT RATED AS 1 OR 2. REPEAT FOR ALL ELEMENTS RATED 1 OR 2]**. So that we may improve the process, please tell us why you selected this rating.

- A1a. Performance of your new system **[TEXT BOX]**
- A1b. Overall experience **[TEXT BOX]**

F5. Do you have any other suggestions for ways to improve Energy Trust’s Solar Electric Program?

1. **[TEXT BOX]**

F6. Thank you for your feedback. In closing, please add or confirm the following information so our survey administrator, The Cadmus Group LLC, can reach you in the event your name is drawn for the gift card.

First Name **[TEXT BOX]**

Last Name **[TEXT BOX]**

Phone **[TEXT BOX]**





Email [TEXT BOX]

Mailing Address [TEXT BOX]

This completes the survey. Your responses are very important to Energy Trust. We appreciate your participation and thank you for your time.