

Memo

To: Board of Directors

From: Jeni Hall, Sr. Project Manager – Solar

Date: February 11, 2020

Re: Staff response to the Solar + Storage Customer Research Report

The Solar + Storage Customer Research conducted by ILLUME provides Energy Trust with valuable insight into the market drivers and existing barriers for customers considering solar + storage systems as well as for solar trade ally contractors offering these systems.

Solar + storage systems can provide customers with more benefits than solar alone. They can offer persistent bill savings due to on-site solar generation and also provide resilience to power essential loads in a home, such as keeping food cold, cell phones charged and the lights on during an electricity outage. In addition to those direct customer benefits, solar + storage systems can provide additional benefits to the utility grid. Some of the systems being installed now will be able to take advantage of utility programs in the future focused on demand response or other ancillary services.

Key findings from the customer research include:

Upfront costs are a barrier. While the decision to install solar or solar + storage is not primarily a financial one, upfront costs can be a barrier, especially for low- to moderate-income customers. Additionally, without a time-of-use or similar rate structure that allows battery storage to provide an ongoing value stream and be used to decrease customers monthly energy bills there is no opportunity for battery storage to provide customers with a payback.

“Energy resilience” is not commonly understood. Resilience was frequently mentioned in the literature review and in interviews with solar trade ally contractors. However, in the focus groups customers did not mention the concept by name. Instead they indicated a desire to have more control over their energy and some customers liked the idea of backup power for critical services such as well pumps.

More information is needed. Customers expressed confusion as to how solar + storage systems operate and what they can and cannot power during an outage. Customers also had questions about the environmental impact of battery storage. Solar trade ally contractors indicated that they do not bring up storage unless asked and sometimes steer customers away from the technology.

Solar can promote energy awareness. Customers indicated installing solar often creates a “positive feedback loop,” spurring greater awareness of their energy use. Several customers reported trying to use energy during off-peak hours more often, interest in adding storage if they have not already and/or switching to electric vehicles.

In 2020, Energy Trust’s solar program will undertake the following strategies and initiatives to address market barriers and further support market drivers for increasing adoption of solar + storage:

- Provide technical and sales training to solar trade ally contractors about solar + storage system capabilities, design and installation so they can more effectively communicate the value to customers.
- Provide educational workshops for customers on the current technology and any tax credits, state rebates or incentives available to decrease their upfront costs.
- Raise customer awareness broadly of solar + storage technology and connect customers with solar trade ally contractors who can provide custom quotes.

MEMO

PREPARED FOR: ENERGY TRUST OF OREGON

PREPARED BY: ILLUME

DATE: JULY 15, 2019

SOLAR + STORAGE CUSTOMER RESEARCH: OVERALL RESEARCH FINDINGS

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This memo presents the findings from six interviews with solar trade ally contractors and five focus groups with a total of 27 participants. The focus groups comprised a mix of residential participants living in Portland and outside the city, and three segments: people looking into solar; people with solar panels installed but not storage; and people with both solar and storage systems installed.

MARKETING FINDINGS

MARKETING SEGMENTS

We found there are misconceptions about both solar and storage technology and that there is a learning curve at every stage of the process of adding solar and/or storage; even the few participants who had done significant research and installed solar or solar plus storage described various misconceptions and learning that had happened along the way. Thus, an overall recommendation is for marketing materials to provide people with the specific questions, key topics and key terms that need to be addressed and understood as part of the decision-making process at their particular stage of the journey. Given the high cost of installing solar plus storage, Energy Trust may want to focus outreach on higher-income individuals, at least initially. We recommend developing different campaigns to address the following groups of potential customers:

Looking into solar (and general community). *Highlight the technological benefits and convenience of solar plus storage to target those who have not yet installed either.* All of our Solar + Storage participants had purchased a solar plus storage system together. Many with solar only had wanted to install storage all at once but did not feel they could afford it at the same time. This suggests that there is an opportunity for marketing specifically to individuals currently considering installing solar, however these efforts must take into account the reality that this group requires more education about the technologies and benefits on the whole.

- **What are the opportunities?**
 - Many of the people we spoke with—including contractors—had limited knowledge of battery providers outside of Tesla. Informational or educational materials like a simple breakdown of battery products available might help both potential customers and contractors understand their options and show that the technology is established. For instance, materials could provide helpful questions to ask in choosing among storage options.
 - Continuing education around the capabilities of solar and solar plus storage and promotion of the technologies through online tools, community events and forums (e.g. neighborhood or home improvement events, home and gardening shows, information sessions)
 - As there was some confusion about sizing of the array and battery, providing informational materials and communications around the need for the battery and solar array to be sized properly would be a helpful tool (e.g., a tip-sheet for things to consider if you're installing solar plus storage).
 - Customer confusion about the technology—and concerns that it remains a new technology—was in some cases exacerbated by contact with multiple contractors who might provide conflicting bids or information.
 - Highlighting the convenience and streamlined process of a single install rather than multiple (in an ideal situation, as most of our Solar + Storage participants had experienced a lag in the installation of their storage).

Adding storage to existing solar. *Support customers who may want to expand their solar array and/or add on.* Most of the individuals in our Portland Solar Only group expressed an ongoing interest in adding storage to their solar

array. This suggests that there may be an opportunity to create messaging or outreach to individuals who have installed solar and might be open to adding storage.

- **What are the opportunities?**

- Given the complexity of sizing an array and connecting to the appropriate panels, there is an opportunity for Energy Trust to help people navigate and understand their battery choices.
- As noted for the previous segment, providing information about the range of battery choices may provide reassurance for people who feel that storage is an untested and newly emerging technology and are inclined to wait before purchasing.

People who have an electric vehicle (EV). *Show the value of coupling technologies.* Several participants who either had storage or were interested in storage had purchased an EV and saw the opportunity to maximize their energy savings through solar plus storage. In at least one case, a person had been considering solar but decided not to move forward until an EV purchase made solar newly relevant to them. See the Key Findings section for more discussion of how people considered stacking these technologies.

- **What are the opportunities?**

- People with EVs or who are considering purchasing one often mentioned battery storage as the obvious next or simultaneous step.
- There may be opportunities for Energy Trust to market the storage credit specifically to those considering EVs (e.g., partnering with dealerships).
- Potential to fold EV manufacturers into the conversation of solar plus storage benefits.

People who have well-water. *Maintaining access to critical resources.* We found that where resiliency was a concern, access to water during a power outage was a stronger motivator than access to power. See the Key Findings section for more discussion of this finding.

- **What are the opportunities?**

- People with well-water were more concerned about power outages than other participants. This may be a segment worth targeting due to the acute difficulty of being without water.
- Because not all storage technologies are capable of supporting events like power-surges that occur with pumps and large equipment, customers need help understanding their critical loads when considering storage. We note that this is true of all customers considering solar plus storage.
- There may be opportunities to target this segment specifically – both through materials designed for these households, and through outreach to people with well-water, well maintenance contractors and organizations like the Oregon Health Authority’s Domestic Well Safety Program.

Although the primary focus of this research was to understand barriers and motivations among potential customers, **we found that solar installers present a critical barrier to moving forward with storage in particular**, mainly because contractors are not well-versed on the technology and, perhaps more importantly, have strong doubts about the benefits of storage to their customers. As such, we recommend prioritizing outreach to this group.

Solar installers: *Market and outreach to local Trade Allies about the technological elements and benefits of battery storage.* The contractors we spoke to felt they did not fully understand storage capabilities and did not have a clear conception of its value proposition. Tesla was the general exception to this rule, and most said Tesla trainings were their primary source of knowledge on battery storage. This lack of knowledge and familiarity effectively prohibits

them from informing and educating their customers about solar plus storage. It might also contribute to the reluctance among contractors to recommend storage—no contractor we spoke to proactively mentioned storage as part of their consultation, and only discussed it if a potential customer asked.

- **What are the opportunities?**
 - Partner with Trade Allies to offer additional trainings on market opportunities to build the familiarity needed to understand the technology and its benefits to customers.
 - Work with storage manufacturers to promote contractor training to maintain Energy Trust’s integrity as brand agnostic while broadening trade ally education.

MARKETING CONSIDERATIONS

Insights on terminology.

Most participants, particularly in the Solar Leads segment, felt ‘storage’ on its own was not as clear as ‘battery storage’, and we note a few participants in this segment were unaware of this technology. Those who already had solar and especially those who had solar and storage, not surprisingly, did not have a strong preference. We note that the term ‘battery’ carried the negative associations or disposability discussed later in relation to barriers but feel that ‘battery storage’ is likely the clearer term overall.

Insights on financing and cost.

For anyone considering solar or solar plus storage, there was a general awareness that this is a considerable investment. As noted below in our overall insights, most participants who had gone through with installation discussed a potential benefit to outlining financials in terms of monthly outlay rather than total cost. Several participants felt this could be helpful to marketing efforts as well.

“I’d talk to people about the financing. We were really pleased with financing. It was about \$100 a month on average in bills. Now we pay \$150 a month to Tesla, so that financing was pleasing. So basically, I’m paying \$50 a month to buy this system.”

-Solar + Storage, Portland

“If someone is interested there are a lot of positives and negatives – I want people to know both sides of the coin. It’s a big financial stress – it’s not affordable: you have to put your money upfront. There are no low interest loans out there—you can get a mortgage lower than a solar loan, then get incentives. It still takes 2 or 3 decades to pay it off. But you’re reducing your carbon footprint. The maintenance-free plans with warranties through the installers are very, very expensive...”

-Solar / Solar + Storage, Rural

REACTIONS TO MARKETING MATERIAL

Overall the flyer did not resonate with customers. Here are some of the reactions we encountered:

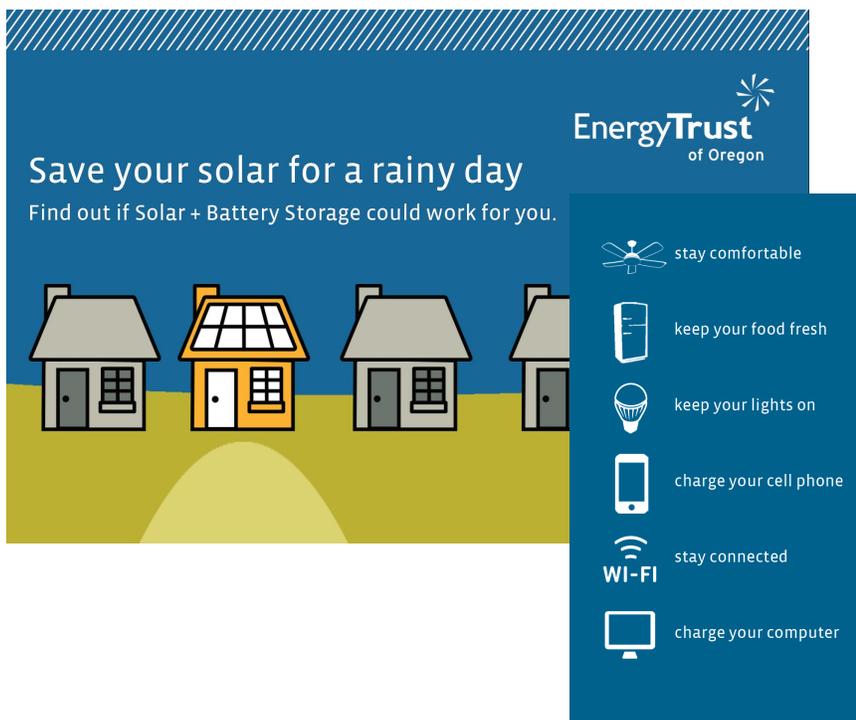
- Most felt it lacked a clear message as to battery storage’s financial and/or environmental value proposition.

- While participants realized the format was not suited to providing a great deal of information, they felt it raised too many questions, which generally related to the Barriers. These questions tended to focus on the capabilities of battery storage (when it runs, for how long, how much it can power) and whether it is an environmentally friendly technology.
- No participants appeared to be aware of the federal tax incentive; this was very appealing to them and they wanted more information.
- Most participants felt it was meant for a different customer group: Solar Leads thought it was aimed at people with solar panels, who in turn felt it was for people without solar panels.
- Several noted that the flier said ‘your solar’—implying it was directed toward people with solar.
- Participants with solar felt it could be a little more sophisticated for their segment given they have at least some understanding of solar technology.
- Participants without solar felt it could be more general and informative since many are unaware of, or unfamiliar with, both technologies.

Participants also addressed the following points more specifically:

- Confusion over whether the ‘rainy day’ was meant figuratively or literally. Several felt that since this was about solar power, the figure of speech might be taken literally.
- Confusion why ‘outages at night’ was specified. Participants assumed battery storage would work during any outage, not only at night.
- Several took the view of someone who may not know who Energy Trust is and thought people might wonder who they are and what their stake in marketing battery storage is.

“The front is confusing. Implying that I make enough power for a rainy day. Which isn’t the case. Here [in Portland]– rainy day is too literal.”
Solar + Storage, Portland



Throughout the day, your solar system powers your home and keeps your battery storage system charged. If there is an outage in the night your solar plus battery storage system can power the things you care about most until the sun comes up again.

Talk to an Energy Trust solar trade ally to find out what incentives you qualify for and take the first step.

+
 To learn more, visit www.energytrust.org/solarbid or call 1.866.368.7878.

Marketing channels.

As a final question, participants were asked what sources they went to for ideas, inspiration, and information about home improvement as a way of ascertaining potentially useful ways to reach a receptive audience. While we are not suggesting Energy Trust place ads directly on the following channels, they might be used to inform a media strategy for relevant messaging. The following are listed in roughly descending order of how frequently they were mentioned.

- HGTV – Many participants reported watching various programs on this network both for general enjoyment and specifically for ideas about home improvement.
- YouTube – A majority of participants noted that once inspired to make a home improvement, they would take to YouTube to watch videos (usually multiple) to understand how to go about making a home improvement.
- This Old House and PBS more generally – Particularly popular with the older crowd, a number of participants said they had been watching this program for years out of interest and for ideas on how to improve their homes.
- Pinterest – A number of participants also reported using Pinterest in a similar way to YouTube, that is to get ideas of how the end-product of a given project might look.
- Houzz – A home improvement and decorating app that also serves as a marketplace to connect home improvers with contractors. Several participants said they used this app to find and store ideas and even make purchases for their homes.

RESEARCH FINDINGS

GENERAL INSIGHTS

In general, the focus group research confirmed low levels of knowledge and awareness of the capabilities of solar as well as storage, as discussed in our previous work for Energy Trust (please see the contractor findings in the appendix of this document). We have organized these Key findings based on their relevance to people who are considering installing solar plus storage, and those who already have solar and may be considering adding storage.

- Considering Install:
 - Installing solar or solar plus storage is not primarily a financial decision, although cost is a factor
 - Resiliency: power, as a resource to maintain critical services like water or medical devices, is an important part of emergency planning
 - Familiarity matters: people who had installed solar knew others with solar
 - Equity and access remain a challenge: “I don’t think it’s for people like me”
 - There are doubts about whether battery storage is environmentally friendly
- After Install:
 - Installing solar panels spurs greater awareness of energy use and in some cases the desire to reduce this further through adding storage and/or an EV
 - Learning curve to understanding energy generation and billing
 - **Participants in the online focus groups (who lived outside Portland) in particular expressed substantial frustrations and a steep learning curve after installation.**

CONSIDERATIONS PRIOR TO INSTALLING SOLAR AND/OR STORAGE

Installing solar or solar plus storage is not primarily a financial decision, though cost is still a factor.

*“At this point, it isn’t financial.”
-Solar Leads, Portland*

Across all groups and in line with what we heard from contractors, the prevailing view among participants was **that installing solar or solar plus storage was generally not a solely financial decision.** With few exceptions, people who had installed solar or solar plus storage were motivated by other concerns and had the financial resources to invest in the technology.

When participants did discuss the financial considerations and implications, those who had already installed solar or solar plus storage tended to consider the decision in terms of **monthly cost rather than total cost.** This kind of thinking may have helped them consider the expense in the context of their existing bills and budget rather than a large lump sum that can seem unaffordable.

Several people we spoke with said they installed solar to

*“Our initial reason was to have clean energy [and] do our little part. We figured, hey we can afford it. It starts to pay off from day one – and, I’m producing clean energy.”
-Solar + Storage, Portland*

*“I heard the 2017 credits would go away and I wanted to jump on it. I got a great deal from a friend in 2018 – needed a tax write off and it helped offset other things. I figured we’d get the panels on the house **instead of kicking the can down the road.**”
-Solar/Solar + Storage, Rural*

‘do their part’ out of care for the environment. For a few participants in the rural groups, installing solar was a way to justify or offset guilt about their behaviors or other choices. More often, participants were making a concerted effort to reduce the impact they have on the environment and installing solar or solar plus storage was part of how they achieved that.

Resiliency: power, as a resource to maintain critical services like water or medical devices, is an important part of emergency planning

Resiliency is the most frequently mentioned driver we came across in our literature review and emerged during interviews with contractors. However, among most focus groups participants, both in Portland and outside, this was not mentioned by name and was hardly alluded to overall. In neither the Portland groups nor the online groups did participants speak explicitly about “energy independence”. However, participants did make statements that indicated a desire to have more control over their energy, such as aligning their energy use with their solar generation.

A few participants brought up Cascadia, but either assumed battery storage would not be much help in that scenario or were unsure. One participant in the online focus group who lived in Bend pointed out that their area is the evacuation area for the whole region, so if anyone is likely to have power, they will. This type of statement indicates an opportunity to educate customers on the implications of a broad regional loss of power.

The two participants (one in an online focus group, one in Portland) who were concerned about resiliency in the face of an outage (whether caused by an earthquake or not) had well-water. Though this is a small sample, this does suggest **that access to water**, rather than maintaining electricity in the home, **is the bigger driver** for solar plus storage (i.e., they could be without electricity and water if they installed only solar; but if they added storage they could use the batteries to power their wells and have water). While being without power for days is seen as an unpleasant, but bearable, inconvenience, the **risk of being without water** was a substantially greater concern.

“We ended up going out and buying a hundred jugs of Poland Springs because it was cheaper than getting a hotel.”
-Solar Leads, Portland

Familiarity matters: people who installed solar often knew someone who had already installed solar.

“Having a friend in the solar business was key – if I didn’t have friends in the industry I wouldn’t be able to do this”
-Solar/Solar + Storage, Rural

A majority of our participants who had installed solar **knew someone who had installed it previously**, whether a family member, friend, or neighbor. These individuals had a greater and longer-standing familiarity with the idea of solar, which likely lowered the barrier to entry because the technology was somewhat ‘proven’ by the other person’s experience.

Many of the older participants (late 60s and 70s) said they’d been thinking

about solar ‘forever’ and had owned or used various past iterations of solar, such as solar powered hot water heating.

“I have been thinking about solar since the 70’s, I bought one of the first solar camping showers” -Solar Only, Portland

To sum up, while solar panels may be considered more ‘mainstream’ and outside the realm of only early-adopters, storage technology has not crossed that threshold. Far fewer participants knew someone who had installed storage. However, as more people continue to install solar or solar plus storage, the number of people with some exposure to these technologies will increase.

Equity and access remain a challenge: “I don’t think it’s for people like me”.

Both solar and solar plus storage technology remain **expensive and out of reach** for many people. Without substantial financing, providing the upfront capital to install is challenging for most, particularly when there are competing projects or interests. This finding was mentioned by several contractors we interviewed and is discussed further in the Journey section at the end of this report.

“My friends are young like me and when I talk to them about it, they think I must be rich to do this. I tell them about the savings, but it’s an expensive thing.”
-Portland, Solar Only

One consequence is that solar has a stigma of being inaccessible and “not for people like me.” This may be a barrier for some people who assume it is out of reach, even if it might actually be viable given the incentives or rebates.

There are some doubts to whether battery storage is environmentally friendly.

Some customers had questions about the environmental consequences of batteries. For conservation-minded individuals, the cost and resource-intensity of both manufacturing and installing batteries verged on “wasteful” for individuals who only rarely experienced outages.

CONSIDERATIONS AFTER SOLAR INSTALLATION THAT MAY IMPACT STORAGE ADOPTION

Installing solar panels spurs greater awareness of energy use and in some cases the desire to reduce this further through adding storage (if they've not done so in the first place) and/or switching to electric vehicles.

Installing solar panels often created a **positive feedback loop** in energy-related awareness and behavior. Participants with solar or solar plus storage reported thinking about energy much more frequently than they had previously. Some said they **think about it 'all the time'** since having panels installed. They also found themselves checking their apps for solar production.

"I check my app all the time and think 'let's go sun'. I love it."
-Solar Only, Portland

For some, this also led to **continual efforts to further reduce their energy use** and impact in various ways. Most participants in the Solar Only segment wanted to get a battery at some point, and many in the Solar + Storage segment (and a few in Solar Only) planned to get an electric vehicle (a few already owned one). Several reported trying to use energy 'off-peak' and using energy-efficient lighting. One participant in the online group noted that she was trying to get to \$10.62 – the bill amount she would pay to remain connected to the grid – indicating that some people may be more keenly motivated by the goal of saving money and making reduction in energy use a more incidental benefit.

The kinds of changes people might make to lower their energy use in some cases was tied to available tax credits. Aside from storage, we did not find that the order of adoption was fixed, as several participants bought electric vehicles prior to storage, but this purchase was viewed either as merely delaying solar panels or as 'bringing solar back up' for them.

There is a learning curve to understanding energy information.

"I'm still learning about the app – When I got my first power bill I was trying to figure out what it means, I called the installers and they couldn't help. Between the bill and the Enlighten app I could track how much is being made by the panels to figure out to see how much I've used – the bill shows what I put on the grid, app shows what I actually produced, then I had to figure out the delta to see what I actually used, this new module should help...but it's not easy."
-Solar/Solar + Storage, Rural

"I had a consumption module installed to help, and I'm learning how to interpret what's going on – I check the app to see what's actually happening with the solar. But PGE makes it difficult to understand what's going on in the bills and what is being used or not."
-Solar/Solar + Storage, Rural

It's important to note that many participants experienced a steep learning curve to understand the impact of their solar array as they learned to navigate the various apps or platforms that display their generation and/or consumption. We hypothesize that those with a more sophisticated understanding of the technology may be more likely to add storage.

DRIVERS AND BARRIERS FOR INSTALLING STORAGE:

Drivers to install storage.

The following drivers are discussed in roughly descending order of their importance, gathered from the focus groups and contractor interviews.

Tax Credits. Despite a sense of fatigue among some participants over communications about tax credits, nearly all participants who were interested in storage said they were waiting for or wanted a tax credit before proceeding, indicating there is little awareness of the existing federal tax credit and that Energy Trust's marketing is timely.

Having a home with well water was a strong, categorical motivator for acquiring battery storage in order to provide access to water during power outages, though it pertains to a smaller segment of the overall population.

"I live outside the city limit and we have a well and once I lost water and know how painful it was, and we had to go to buy jugs of water. I wanted to get a battery so if we lost power we wouldn't lose water."
-Solar Leads, Portland

Further reducing their energy use and impact on existing energy production and infrastructure.

Some customers had a strong desire to eliminate or nearly eliminate their power bill, which motivated them to cut their energy use after their solar was installed. In some cases this was related to living on a fixed income in retirement, in other cases, participants seemed to find some joy in the challenge of reducing their consumption. Those whose primary motivation is related to living on a fixed or limited income may respond to messaging quite differently than those who are trying to 'beat the system' by getting their bill to zero as a kind of game.

"I am home all the time and I have tall windows that are 10 feet tall, so now I am living on savings. The more I save is the more I keep."
-Solar Leads, Portland

Getting more from their existing solar system. Several mentioned that having a battery would allow their solar to work for them all the time rather than just during the day. As such, some participants felt that storage would extend the usefulness of their solar panels, and that they could 'keep the power they produced' (though others felt there was equal utility in selling back to the grid).

Barriers to installing storage.

The following barriers are discussed in roughly descending order of their strength, as we understand it from the focus groups and contractor interviews.

A belief that the cost is not worth it.

This was the single most cited barrier by contractors and was mentioned frequently by participants as well who felt storage was a substantial expense that offered limited utility.

"I thought storage would be as much a gain as solar. Then we found out it would only be used when we were out of power, and we can sell it back to the grid with just solar. We don't lose power in Portland a lot."
-Portland, Solar Leads

Contractors who dissuade people from storage. A related issue was solar installation contractors who either would not address battery storage or who actively dissuaded them from getting it (one participant claimed her contractor simply said storage ‘wasn’t how solar worked’ and that you simply sell back to the grid). This confirmed what contractors told us in interviews about how they did not bring up storage unless asked, and sometimes steered people away from pursuing it.

Lacking confidence in contractors. Many participants discussed having bad experiences with contractors. Most of these related to concerns that they were ‘used car salesmen’ who did not inspire confidence, and a few had bought panels from companies who later went bankrupt (or claimed to).

“I talked to my sister and she told me Tesla was working on some solar and that it will be more efficient, so I thought why would I put it in now when they might have more efficiency in the future.”

-Portland, Solar Leads

Waiting for the technology to improve. Confirming what we heard from contractors regarding what they themselves recommended, several participants who were interested in storage felt that the technology was advancing quickly enough that it seemed better to wait.

Payback is still an issue. Even with the acknowledgement that this investment is not solely or even primarily a financially based one, return on investment still put some participants off.

“My parents’ generation stayed in the same home, but my generation is moving around a lot. But do I want an 8-10 buyback period? I want to move around because I can.”

-Solar Leads, Portland

“I thought about storage but looking at a 30-year payback is a hair too much.”

-Solar Only, Portland.

The concern that battery storage is ‘wasteful’ – several felt that since they rarely experience outages, adding battery storage would be wasteful.

Confusion and misunderstandings about how battery storage operates. Many participants were unsure of what it could power and for how long, confirming what all of the contractors had described.

“I know I don’t need that. I would think “I’m not buying a big battery, batteries don’t last.”

- Portland, Solar Only.

THE CUSTOMER JOURNEY

The conversations with participants who had already installed solar were very revealing around the challenges to installing and integrating solar or solar plus storage. Although out of scope for this project, should Energy Trust be interested in further discussion of these challenges or how to mitigate them and/or support people through the process, the ILLUME team could devote additional time to analysis and reporting on this piece.

Initial interest. Many participants knew someone with solar, had some previous experience with it, or had been interested for some time (as noted above).

Gathering information. There was a range of online and in-person activities and levels of information gathering across the groups. Some participants did very little research outside of speaking with a contractor or contractors while others research extensively online (Energy Trust and EnergySage sites were mentioned frequently, and Reddit came up as a source for some); going to information sessions; talking to people who have solar and/or storage; going on home tours.

Taking action. Participants often reported mulling it over for years before moving to this phase. Many reported doing so in response to prices coming down, expiring tax credits, or having moved into a home they planned to be in for some time.

Getting bids. There was a broad range of approaches to this stage as well, from going with a contractor who knocked on their door to getting up to 10 bids to choose from.

Decision to install solar or solar plus storage. Most participants were considering solar or solar plus storage alongside other competing projects. Often those projects were in the same category (e.g. home improvement or maintenance), but not always (several mentioned prioritizing a car, or waiting to install because of college tuition). This meant many deferred the installation initially, and once people had attended to more urgent projects or expenses, they reconsidered solar and, in some cases, installed at that point. Incentives were frequently mentioned catalysts as well.

“Someone came to the house and talked dollars and cents, but we didn’t do it. Then recently we saw something online and responded to it and received a proposal – it took some time – had a redesign around trees – we started in summer last year and didn’t get it installed until December.”

-Solar/Solar + Storage Rural

Decision not to install. See Issues (below) and Barriers.

Issues that arose around installation.

Long installation process:

- Most customers who had installed solar did not install it after the first bid. Many had to make other updates to their home first (such as insulation or new roofing).

Learning curve after installation:

- A few participants who had recently installed solar were having difficulty understanding their bill, understanding consumption vs. generation, net metering, and so on.
- A few PGE customers were also having issues with their utility company getting their bill wrong, for instance their bill being almost nothing one month and hundreds of dollars the next.

Delays or issues with battery storage:

- Nearly every participant in the Solar + Storage segment had issues with delayed installation (primarily relating to Tesla’s supply).

- One participant said the circuits had not been wired properly, and that the issue arose from poor communication between the contractor and electrician.

“The electrical contractor for the new house asked how the solar would ‘connect in’, I didn’t know but tried to connect him to the solar evaluation guy that came to the house. That guy (from the solar company) was ‘no help with the electrician’ and so I called the salesman and had him draw up a plan with a sub-panel (that had the security lights, etc.) which the electrician made for the system, with a pipe up to the roof, etc. But then when Solar City came out, they said we can’t run it into the sub-panel, we need to go to the main breaker, so they added ANOTHER box. So, when the battery was finally installed, it wasn’t connected in such a way that it can control the sub-panel they added.”

-Solar + Storage, Portland

APPENDICES

APPENDIX A: RESEARCH BACKGROUND

The purpose of this research is to understand the motivations and barriers for customers installing battery storage to inform marketing efforts relating to federal tax credits for this technology that end this year. We spoke with multiple solar installers and three market segments to gain a holistic understanding of the customer experience. The three segments include: 1) People who are considering solar (Solar Leads), 2) those who had installed solar panels but not storage (Solar Only), and 3) those who installed both solar and storage (Solar plus Storage).

RESEARCH OBJECTIVES

The overall purpose of this research is to address the following questions:

1. How do people think and speak about energy use in their homes and energy in general?
2. What do people understand and believe about the available solar plus storage technologies and the benefits of combining storage with solar?
3. How and where do customers seek information on solar and solar plus storage, and what information are they most interested in?
4. What are customer questions relating to solar plus storage?
5. What do people understand and believe about their electric utility's approach or offerings related to solar plus storage?
6. Do customers have electric vehicles or other technologies in addition to solar plus storage? Do they see a value in coupling multiple technologies?
7. Are customers aware that most solar systems will not work during a power outage?
8. How do installers articulate the benefits of solar plus storage to potential buyers? How does the appeal of solar change when it is paired with storage?
9. Which types of customers are interested in which features of a solar plus storage system?
10. What solar plus storage related messaging and strategies resonate with customers?
11. What types of customer engagement strategies work best for solar plus storage?
12. Customer types:
 - a. Customers with existing solar systems vs without
 - b. Rural vs urban customers
 - c. Residential vs business customers
 - d. Other demographics and firmographics
13. Features:
 - a. Resilience
 - b. Other features?

RESEARCH OVERVIEW: 5 FOCUS GROUPS

We recruited participants from a database provided by Energy Trust and comprised a range of ages and life stages, including participants without children, parents of children of various ages (in and out of the home), and retirees.

LOCATION	SOLAR LEADS	SOLAR ONLY	SOLAR + STORAGE
Portland (in-person)	1 Group (n=6)	1 Group (n=5)	1 Group (n=8)
Online (Outside Portland)	1 Group (n=3)	Combined (n=5)	

STRUCTURE OF THE GROUPS:

Each group was organized into three overall sections. In the first, we explored how participants thought about energy overall and in their homes. In the second, participants shared their individual journey with solar or solar plus storage and we explored barriers and drivers around solar or solar plus storage. Finally, we conducted message testing around prototype marketing materials provided by Energy Trust of Oregon.

APPENDIX B: CONTRACTOR FINDINGS

RESEARCH QUESTIONS

The ILLUME team conducted four in-depth interviews (IDIs) with contractors over the phone on Thursday, March 21 and Friday, March 22nd. The interviewees and interview dates are provided in Table 1. Each interviewee received a \$150 Visa gift card in appreciation of their time.

TABLE 1. LIST OF CONTRACTORS INTERVIEWED

COMPANY NAME	CONTACT INTERVIEWED	DATE OF INTERVIEW	MARKET ADDRESSED
Sunlight Solar	Nathan Braun	Thursday, March 21, 2019	Residential
Sunlight Solar	Sean Micken	Thursday, March 21, 2019	Residential/Commercial
A&R Solar	TJ Merrill	Friday, March 22, 2019	Residential
Elemental Energy	Kelli Wolford	Friday, March 22, 2019	Residential
True South Solar	Shawn Schreiner	Friday, April 5, 2019	Residential/Commercial
Tesla	Victor Liu	Monday, April 15, 2019	Residential

Key findings from the research include:

1. Installing battery storage with solar is cost-prohibitive to much of the population.
 - a. Without time-of-use (TOU) rates, significant state and federal tax incentives, or rebates from other stakeholders like utilities or Energy Trust of Oregon, contractors said that battery storage is often out of reach for much of the Oregon population.
2. Contractors believed that resiliency is the primary motivation for customers seeking battery storage with their solar system, followed by reducing their use or reliance on fossil fuels.
3. Customers usually generally have to start the conversation about storage with contractors, as most said they do not typically suggest batteries to customers proactively.
 - a. Most of the contractors we spoke to were not convinced that adding storage was not worth the cost to their customers and thus do not recommend it.
4. Contractors' knowledge and recommendations is largely dependent on training they received from manufacturers; most of them recommend Tesla because that is the only manufacturer they had been trained by.
 - b. Tesla is raising overall awareness about storage and seems to be leading the market in brand recognition.
5. Contractors would like a source of information on solar and solar plus storage that they can point customers to for unbiased information.
 - a. Contractors were unsure where customers get information regarding solar plus storage before they engage and felt most had limited knowledge. They discussed many misconceptions about the solar and storage technologies that persist in the market, including the overall capability of battery support in the operation of solar during a power outage.

SUMMARY OF FINDINGS

The research team summarized findings by research question in [Table 2](#).

TABLE 2: RESEARCH QUESTIONS AND SUMMARY OF FINDINGS

RESEARCH QUESTIONS	SUMMARY OF FINDINGS
How do people think and speak about and energy use in their homes and energy in general?	<p>One contractor talked about some people acquiring solar so they could consume as much energy as possible guilt-free.</p> <p>Two said their approach was to help customers increase energy efficiency in their home before sizing PV; however, no contractor had a strong pulse on how people think and speak about energy use in their homes.</p> <p>This will be a topic for focus group research.</p>
What do people understand and believe about the available solar plus storage technologies and the benefits of combining storage with solar?	<p>Customers have many misconceptions when they engage contractors for quotes on solar or solar plus storage, though several felt these had lessened somewhat over their time.</p> <ol style="list-style-type: none"> 1. Many people believe having solar alone will help in a power outage 2. Many customers believe storage is less expensive than it is 3. Many customers do not understand what will function in their home with battery support
How and where do customers seek information on solar and solar plus storage, and what information are they most interested in?	<p>Contractors were unable to specify where customers are getting their information before they reach out to them. All contractors talked about the education process - how they work with customers to help them understand operations, system requirements and maintenance. Some contractors believed an independent, unbiased source of information to direct customers to would be extremely valuable.</p>
What are customers' primary questions relating to solar and storage?	<p>There was consensus that customers' primary concern and initial questions are about cost. Additional questions include:</p> <ol style="list-style-type: none"> 1. What will the system provide in terms of power during an outage? 2. Will it work for their home? 3. How it will impact their utility bill or interaction with the utility?
What do people understand and believe about their electric utility's approach or offerings related to solar plus storage?	<p>This appeared to be unknown for the contractors. The contractors did discuss their opinion that TOU rates would be a critical driver of cost effectiveness for the equipment.</p>
Do customers have electric vehicles or other technologies in addition to solar plus storage? Do they see a value in coupling multiple technologies?	<p>Coupling EVs and PVs is growing in popularity. One contractor estimated 10% of customers have EVs with their PV, stating this could be higher because people may be buying EVs after they have installed solar.</p>
Are customers aware that most solar systems will not work during a power outage?	<p>All contractors mentioned that customers are unaware that their PV system will not work during a power outage. One contractor even said that he is surprised because some customers will have already worked with solar contractors and STILL not know that their system would not work during a power outage.</p>

<p>How do installers articulate the benefits of solar plus storage to potential buyers? How does the appeal of solar change when it is paired with storage?</p>	<p>Customers will have to drive this conversation. Most contractors do not suggest battery storage due to the high cost. When they do discuss benefits of pairing storage, it is in regard to resiliency and emergency preparedness.</p>
<p>Which types of customers are interested in which features of a solar plus storage system?</p>	<p>Contractors suggested that in their experience and recollection, the following types of customers were those who tended to ask about solar plus storage:</p> <ol style="list-style-type: none"> 1. Customers in rural regions with frequent power outages 2. Customers in their mid-30s to 40s who are tech savvy and have higher income levels 3. Retirees who would like to receive the tax incentive while they still have income and would like to reduce their monthly costs during retirement 4. Customers who are concerned about disaster preparedness and the Cascadia earthquake in particular
<p>What solar plus storage related messaging and strategies resonate with customers?</p>	<p>Contractors felt that most people are either interested in resiliency or environmental benefits. With the reduced incentive levels (several mentioned the expiration of RETC), customers acquiring these technologies for cost benefit reasons had declined steeply. Will continue to explore this topic in customer focus groups.</p>
<p>What types of customer engagement strategies work best for solar plus storage?</p>	<p>Contractors felt that proactive, direct marketing to potential does not typically work. Several mentioned trying to use marketing but having low or no responses. Overall, they focus on customers that reach out to them. One contractor said that his company tries to use some social media and email especially about tax incentives that may be expiring.</p>
<p>Customer types:</p>	<p>Based on contractor research, the following customer types/segments seem to be emerging but will be assessed in primary research.</p> <ol style="list-style-type: none"> 1. Retirees of a higher income bracket <ol style="list-style-type: none"> a. Leveraging tax incentives while they have higher income b. Purchasing to lower costs during retirement 2. Mid-30s to 40s, with a higher income, tech savvy <ol style="list-style-type: none"> a. Have EVs or are interested in them b. Environmental justification for lessening their reliance on the utility 3. Rural populations <ol style="list-style-type: none"> a. Frequent power outages and wanting some form of backup to support their home or pumps during an outage b. Also frequent environmental reasoning - wanting to lessen their use of fossil fuels 4. Commercial customers <ol style="list-style-type: none"> a. Emergency preparedness - planning for the earthquake, typically while moving into a different or new building for that company (an armory and a school were also mentioned)