# Meeting Customers Where They're At... Literally: Virtual Verification as a Carbon-Friendly EM&V Tool for Residential Programs

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## ABSTRACT

Verifying installed energy efficiency measures in residential buildings can be challenging. In-person field verification, although valuable to evaluation, asks a lot of customers and utilities. Traditionally, customers must be at home for an extended window of time and allow a technician into their home. On top of the customer burden, fieldwork is cost- and carbon-intensive. Phone verification is quick but can be less reliable without visual confirmation. These two modes of verification beg the question: how can we reduce customer burden and utility costs while maintaining reliability? Guidehouse's answer: virtual verification. Virtual approaches are ideal for difficult to reach customers and sites with security and/or physical safety constraints and are often preferable to the customer over scheduling in-person visits.

In partnership with Atlantic City Electric (ACE) and APPRISE Solutions, Guidehouse conducted two program evaluations in 2023 by leveraging virtual verification. Guidehouse uses a customizable software platform that enables high fidelity virtual site visits compatible with all mobile devices, which require no application or software downloads for the customer. The tool is optimized for low cellular and Wi-Fi bandwidth environments and uses the customer's mobile device GPS to confirm location and geotag collected data. The tool also features augmented reality tools to more easily communicate with the customer and eliminate the need for in-person site visits for verification.

The average time spent on virtual session was less than 5 minutes. The evaluation efforts were largely met with positive customer feedback and enthusiasm over participating in virtual verification calls in lieu of an in-person visit.

## Introduction

Evaluators have routinely leveraged field visits as a "tried-and-true" verification procedure for commercial and industrial (C&I) buildings. When it is time for a commercial evaluation, often the easiest and most reliable tactic is to contact the building operator and schedule a site visit. The building operator typically has an in-depth understanding of the equipment that was installed and can answer questions on usage and behavior. If needed, the building operator can help the field engineer access trend data and locate hard-to-find installed measures. In residential buildings, however, field work can be more complicated to coordinate. The difficulty in conducting residential field work has led many evaluators to rely on online or phone surveys, thus reducing the overall rigor of verification. This paper explores the limitations of past verification tactics in residential spaces and introduces virtual verification as a solution. Virtual verification has the potential to bolster the certainty of Evaluation, Measurement, and Verification (EM&V) findings while saving time, cost, and carbon.

## Challenges with Traditional Verification Methods in the Residential Sector

Depending on the rigor and budget of the residential energy efficiency program evaluation, evaluators will likely leverage one of the three most common verification strategies: customer surveys, phone interviews, or onsite visits. Customer surveys are a common tool for collecting self-reported information on energy efficiency projects. Phone calls are often conducted with the customer to document project information directly from the customer in real-time. This allows an opportunity for clarification and follow-up questions. Lastly, onsite visits can be conducted at customers' homes directly. During an onsite visit, there are similar benefits to a phone call, however an evaluator can also sidestep the inherent level of uncertainty in customer self-reported information. While all these methods have merit, there are clear issues and barriers that accompany them as well.

### Customer Surveys

Many evaluations conduct a process and impact evaluation at the same time. This can create an obvious efficiency to include impact questions in a customer survey. Customer surveys, while efficient from a time and resources perspective, inherently have lower customer response rates, as customers have been shown to be less likely to respond to a digital survey than a phone call (Wu et al. 2022). Customer surveys also do not allow an opportunity for additional follow up or clarifying questions to be asked if a customer provides responses or details that go beyond traditional survey structure. Lastly, customer surveys are a means to collect customer self-reported information. While the practice of collecting customer self-reported data is generally acceptable in many cases, it inherently carries with it some level of uncertainty and evaluation risk.

### Phone Interviews

Phone interviews are more time and resource consuming than digital surveys, however they offer an improved layer of customer satisfaction by providing the opportunity to speak with a person directly. Additionally, phone interviews provide opportunities for clarifying or follow-up questions to be asked directly to the customer in real time. However, phone interviews, like customer surveys, still primarily rely heavily on customer self-reported information.

### Onsite Visits

The major advantage of onsite field verification is by and large the certainty added by allowing evaluation staff to observe and document installed energy efficiency equipment firsthand. While onsite verifications boast this added level of evaluation certainty, they introduce new forms of field verification barriers. Onsite verifications typically consist of sending evaluation staff to customers' homes to visually verify equipment installment, operational status, equipment specifications, and operation schedules and controls. Depending on the evaluation or client company, evaluation staff often conduct onsite visits in pairs. The cost of travel and accommodations for two field engineers is much more costly than both customer surveys and phone verifications. Associated carbon emissions from travel should be factored in, particularly when large quantities of field verifications need to take place. Additionally, there is inherently a small amount of safety risk when it comes to travel pertaining to both transportation risk as well

as the inherent risk of being physically onsite, which is not a factor through other means of electronically based verification methods. Health concerns should also be considered, as evaluation staff are at risk of being exposed to pathogens, which can lead to various illnesses. Lastly, residential onsite verifications can be inherently invasive for customers, who must agree to allow evaluation staff into their homes to even make this means of field verification a possibility.

Evaluation budget and desired evaluation rigor are typically the primary drivers for determining the necessary field verification method. All of the aforementioned means of field verification, while each having their own respective positives and established validity, demonstrate clear disadvantages pertaining to either costs, safety, or evaluation uncertainty. These inherent issues are largely accepted within the practice and are accounted for when planning evaluation and verification activities.

## The Benefits of Virtual Verification

Virtual verification typically involves evaluation staff setting up video calls with customers for the purpose of being able to visually verify aspects of the installed energy efficiency equipment themselves directly. The evaluation staff is therefore able to view the equipment while talking with the customer, which provides evaluation staff the opportunity to ask specific questions pertaining to the installed equipment as prompted by the virtual viewing of a given project. This process provides the evaluation staff most of the benefits of physically conducting an onsite verification while eliminating most of drawbacks listed in the previous section.

### Lower Cost

Cost is one of the most easily recognizable benefits of conducting virtual verification methods. While both onsite and virtual verification require the upfront time to schedule the actual visit with the customer, the cost differential beyond initial scheduling in sizable. Paying for multiple evaluation staff to travel to the site as well as the time is takes to get them there is reduced to the time of a phone call, as virtual verification oftentimes takes between 5 and 10 minutes to conclude. As a result, essentially all carbon emissions pertaining to all means of travel via transportation are also eliminated, making virtual verification an environmentally friendly verification solution. The limiting of travel also inherently removes the person-to-person physical interaction, therefore limiting evaluation staff exposure to pathogens that might otherwise induce illness. Evaluation staff illness pertains directly to health concerns, of course, but also by extension affects productivity and workflow if staff are at all forced to take sick leave.

### Safety and Privacy

Virtual verification removes the person-to-person physical interaction, which reduces risk to evaluation staff inherent with being on site. In terms of the “safety in numbers” philosophy practiced by sending evaluation staff into the field in pairs, virtual verification is in many ways logistically the same as a phone verification. This reduces the need from the two field evaluators needed in an onsite to just a single evaluation staff member. Additionally, virtual verification calls allow the customers to limit or control what all is viewed in their home. Onsite evaluation

staff would need to physically occupy the spaces in a customer's home as part of locating the energy efficiency equipment installed, whereas virtual verification calls can be limited to just the space in which the equipment occupies.

### Increased Evaluation Certainty

Lastly, virtual verification allows evaluation staff to verify all aspects of the installed energy efficiency equipment as if they were physically onsite, which circumvents the uncertainty risk inherent in customer self-reported data collection. By removing a step in the chain of conveying equipment information, the risk for human error by means of data collection is reduced. Observing the project directly allows the evaluation team to have increased certainty in their documented results.

## Virtual Verification as a Tool

While there are many digital platforms available for the purposes of virtual verification, the Guidehouse's FieldOps team elects to utilize a platform called Blitzz. Blitzz is a customized software platform that enables high fidelity virtual site visits compatible with all mobile devices. These virtual site visits require no application or software downloads for the customer, which is oftentimes a notable barrier for customers that are less tech savvy. Blitzz is optimized for low cellular and Wi-Fi bandwidth environments and uses the customer's mobile device GPS to confirm location and geo-tag collected data, which can be extremely useful for rural residential customers with otherwise poor service or commercial customers with facilities that physically restrict the quality of typical calls.

Blitzz also features augmented reality tools like Live Pointer, Mark-up, Annotation, and Image Recognition, which eliminate the need for in-person site visits for verification. These tools allow the evaluation staff to physically interact with the customer on-screen for the purposes of directing the customer to exact areas or information needed by the evaluation staff. For example, the evaluation staff member leading the call could ask the customer to point their screen at the installed equipment, and then proceed to use the Live Pointer tool to direct the customer to where the equipment nameplate might be located that might otherwise be difficult for the customer to locate themselves with no visual assistance, such as through a phone interview conducted with a customer.

## Virtual Verification in the Residential Sector

The historical and current precedent for the use of virtual verification with Guidehouse's FieldOps team has almost exclusively been for commercial and industrial verification. While Blitzz has not been utilized by Guidehouse as a primary means of verification on the program evaluation scale, Blitzz has been used in an ad hoc capacity to aid in the verification of commercial and industrial customer energy efficiency projects. These types of projects typically pertain to customer facilities that feature restricted areas or whole facility restricted access, such as pharmaceutical manufacturing facilities, as well as customers with unpredictable or largely unavailable schedules. Overall, these types of commercial and industrial facilities are relatively few in number.

The evaluation of two of ACE's residential energy efficiency programs for their second program year, which spans from July 1, 2022 to June 30, 2023, marks the first and second

residential program level Guidehouse evaluations to utilize virtual verification as the primary means of verification.

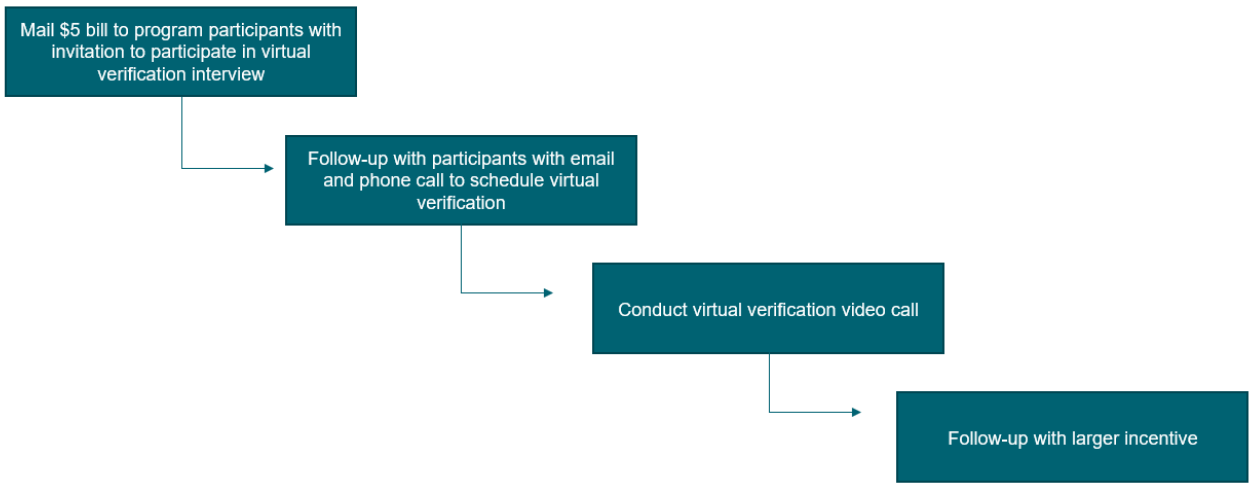
## Residential Virtual Verification as a Case Study

Guidehouse, in partnership with APPRISE Solutions, currently serves as the Independent Program Evaluator for the evaluation, measurement, and verification of energy efficiency programs offered by ACE. This effort spans ACE's first complete program cycle, or triennium, which is comprised of Program Year 1 through Program Year 3. Each individual energy efficiency program within ACE's portfolio was required to receive a minimum of two impact and process evaluations during this first program cycle at the Basic Rigor Level, as generally defined by the Pennsylvania EM&V Framework and the California Protocols.

Basic rigor impact evaluations were completed for both the Residential HVAC and Residential Appliance Rebates programs in Program Year 1. By design, the impact evaluation rigor for both of these residential programs were enhanced to collect and provide more reliable measure level information for the purposes of better informing future TRM updates. In lieu of a more traditional survey approach to collect customer self-reported data, the EM&V team employed a means virtual verification through Blitzz.

APPRISE Solutions contacted program participants with an invitation to participate in the virtual verification video call. Overall, customers seemed receptive to the technology and did not voice concerns. To help build rapport with participants, APPRISE Solutions mailed a $5 bill with each invitation. The outreach steps are summarized in Figure 1.

*Figure 1. Customer Outreach Steps for Virtual Verification*




### ACE's Residential HVAC Program Evaluation

The evaluation of ACE's Residential HVAC program involved conducting virtual verification calls to a sample of the program participants. A total of 214 customers were sampled for this program while 49 total virtual verification calls were completed, resulting in a response

rate of 23%. ACE's Residential HVAC program is comprised of the following incentivized HVAC measures:

- Central Air Conditioners (CACs)
- Ductless Mini-Split Heat Pumps (DMSHPs)
- Air Source Heat Pumps (ASHPs)
- Ductless Mini-Split Air Conditioners (DMSACs)
- Furnace Fans
- Smart Thermostats
- Assorted Gas Measures, including:
    - Gas Furnaces
    - Tankless Water Heaters
    - Gas Boilers

Virtual verification calls conducted for this program targeted the verification of HVAC equipment installation, operational status, system capacities and efficiencies.

**ACE's Residential Appliance Rebates Program Evaluation**

The evaluation of ACE's Residential Appliance Rebates program involved conducting virtual verification calls to a sample of the program participants. A total of 253 customers were sampled for this program while 44 total virtual verification calls were completed, resulting in a response rate of 17%. ACE's Residential Appliance Rebates program is comprised of the following incentivized appliances:

- Clothes Washers
- Clothes Dryers
- Refrigerators
- Air Purifiers
- Dehumidifiers
- Room Air Conditioners
- Heat Pump Water Heaters

Virtual verification calls conducted for this program targeted the verification of appliance operational status as well as appliance specifications such as capacities, efficiencies, clean air delivery rate, etc.

## The Downsides of Virtual Verification

While virtual verification might seemingly address the downsides of traditional verification methodologies such as customer surveys, customer phone interviews, and onsite verifications, it is not without its own downsides. This section addresses some of the issues or limitations that have either been observed by Guidehouse and APPRISE Solutions or identified as potential future barriers to address.

### No Ability to Meter

One clear advantage of onsite verification above all other methods of field verification mentioned in this paper is the ability to conduct direct site metering on the installed energy efficiency equipment. Site metering tends to pertain more to the commercial and industrial sectors, as they contain larger and more complex equipment. However, metering studies are one means by which residential metering has precedent. Without physically being onsite, metering equipment cannot be installed.

### Technology Can Be a Barrier

Guidehouse and APPRISE Solutions observed through the piloting of virtual verification as a program wide verification approach that some customers show inherent resistance to the video call aspect of virtual verification. Some customers voiced that they weren't technologically savvy, and while Blitzz is much easier and simpler to utilize relative to other virtual platforms, there still existed a technological barrier. Some customers also reported feeling like the virtual call was invasive in nature and would have preferred an alternative means of verification. However, most customers reported that they much preferred the virtual verification call if an onsite visit were the alternative, acknowledging the convenience of not having to accommodate a stranger in their home.

### Scheduling with Residential Customers

A challenge with any sort of interactive verification method is being able to efficiently schedule a time that works for both the evaluation staff and the customer. The commercial and industrial sector are oftentimes easier to schedule, as evaluation staff are typically contacting commercial customers during business hours at their place of work, which is where the energy efficient equipment is installed. However, residential projects can be trickier to schedule due to the misalignment of evaluation staff work hours and the hours during which the customer is home, where their energy efficient equipment is installed. This is made much simpler for customers that have typically have weekday time off or for customers that work from home on a regular basis. For others, coordinating a time at which they would be home and available for a virtual verification call was difficult.

## Virtual Verification Lessons Learned and Future Recommendations

Guidehouse and APPRISE Solutions believe the piloting of Blitzz as a virtual verification tool for ACE's residential programs was a success. Achieving visual verification of energy efficiency equipment while keeping program evaluation budget in check met the specific needs of program evaluation at the time. Nevertheless, several lessons were learned as part of this piloting process that our teams will take into consideration when planning or recommending future evaluations via virtual verification.

### Safety Above All Else

While the physical safety of the evaluation staff conducting virtual verification calls is essentially guaranteed, the evaluation team found that certain customers may exhibit a propensity

to obtain desired data with less regard for safety, acting against even the caution and advisement of the evaluation staff. One customer insisted on scaling a ladder to obtain nameplate information for the exterior unit of an installed HVAC system, despite the evaluation staff member indicating that the information for the purpose of our evaluation was deemed to be inaccessible or unavailable, and therefore not necessary due to safety constraints. The evaluation team has proposed that future evaluations incorporate more language be made available to the customer to dissuade them from engaging in unnecessary, and more importantly unsafe, situations.

### Maximizing Customer Convenience

Virtual verification creates an opportunity for customers share important information with evaluators while minimizing risks and building trust. The technology creates a more inclusive environment where some folks who may have shied away from an onsite visit are more willing to participate in the virtual equivalent. Virtual verifications can even be completed in between meetings for participants who work from home and with staff across multiple time zones, scheduling can be coordinated to be as convenient as possible.

## Conclusions

While the verification of installed energy efficiency measures in residential buildings can be challenging, virtual verification has proven to be a reliable means of field verification that is neither cost- nor carbon-intensive. Virtual verification calls can be conducted quickly with calls typically taking only 5 to 10 minutes of a customer's time, and virtual visits have been proven to be preferable to customers over scheduling onsite visits. Virtual verification also reduces evaluation uncertainty by allowing evaluation staff to verify energy efficient equipment directly. Given the successes of Guidehouse's evaluations of two of ACE's residential programs, a precedent has now been established for utilizing virtual verification as the primary means of residential field verification. Guidehouse will continue to leverage virtual verification as a means of field verification on future evaluations.

## References

"Remote Video Support, Inspections and CoBrowse | Blitzz." n.d. Blitzz.co. Accessed February 27, 2024. https://blitzz.co/.

Puthiyamadam, Tom, and José Reyes. 2018. "Experience Is Everything: Here's How to Get It Right." PWC. https://www.pwc.com/us/en/advisory-services/publications/consumer-intelligence-series/pwc-consumer-intelligence-series-customer-experience.pdf.

Wu, Meng-Jia, Kelly Zhao, and Francisca Fils-Aime. 2022. "Response Rates of Online Surveys in Published Research: A Meta-Analysis." Computers in Human Behavior Reports 7 (2): 1–11. https://www.sciencedirect.com/science/article/pii/S2451958822000409.