Amy Hollander:
Hello, my name is Amy Hollander of NREL, the National Renewable Energy Lab in Golden, Colorado. Thank you for joining today's webinar on Weatherization: an Effective Home Energy Savings Behavior. I want to give special thanks to the United States Department of Energy's John Mucky for sponsoring technical assistance from NREL for the Weatherization Innovation grantee.

Today's webinar is on effective home energy savings behavior with a focus on low income weatherization clients. This webinar is a rare opportunity to see the latest academic information and studies depicting how client education and the one on one discussion with residents produces up to a 16 percent increase in energy savings behavior.

Today's webinar has been directed by noted sustainable energy sociologist Dr. Barbara Farquhar, a senior research associate at the University of Colorado at Boulder's Renewable and Sustainable Energy Institute, also known as RASEI. The webinar presenters are Dr. Deborah Baker Brannan, researcher in behavioral economics, and Wayne Tomac, graduate research assistant in sustainable design and planning.

Without further delay it's my pleasure to introduce Dr. Baker Brannan as our first speaker. Dr. Deborah Baker Brannan received her PhD in economics from the University of Colorado in Boulder earlier this month. Her dissertation research focused on the application of behavioral economics to energy use decisions and the evaluation of state level renewable energy policy. During her time as a graduate student Deborah worked for RASEI and NREL as well as taught courses in economics at the university. Later this summer Deborah will begin as the managing consultant with Navigant Consulting where she will work on products related to energy efficiency and demand response program design and evaluation.

And with that it's my pleasure to introduce Dr. Baker Brannan, Dr. Deborah Baker Brannan.

Dr. Brannan:
Thank you, Amy and good day to everyone. Before we get started I just wanted to make a brief comment and highlight that our team at RASEI is really a multidisciplinary team and that I wanted to highlight that this presentation's based on an extensive literature review of research in the behavioral sciences as well as programmatic experience.

[Next Slide]
So to begin this webinar I'd like to give a brief overview of what we'll be discussing today. And everything we discuss really centers around this idea of the human dimension of energy. And what we mean by this is that people and their behaviors, habits and routines play a significant role in how much energy a household uses. So it's all of those actions that people take that result in energy use like using the clothes dryer instead of air drying clothes or not opening windows when it's cool outside instead of using the air conditioner. It's also all of those actions that people do not take that could save them

energy like not unplugging appliance that are not in use or not changing the thermostat setting when they leave the house.

Unfortunately the human dimension's often overlooked as the source of energy savings with the focus primarily being on buildings and technology rather than the people living in the buildings or the people using the technology. So as an introduction we provide some motivation as to why low income weatherization programs should care about the human dimension and describe why these programs have the unique opportunity to influence behavior.

Our team at RASEI has developed a framework that will allow weatherization programs to effectively integrate behavior change into their program resulting a more comprehensive approach to saving energy for low income households. There are three components to this framework that we'll discuss today. The first is that by knowing and understanding the target audience programs can be tailored. But tailoring's generally not enough. The second component is that behavior change programs should be designed so that households are involved and engaged in changing their own behaviors. Finally, once households are engaged motivational techniques can be used to further enable households to make changes in their behavior.

[Next slide]
So to get started I first want you to consider a few households that live in Austin, Texas. Both households are made up of one adult and three children of similar ages. Both live in apartment buildings of 850 square foot and both apartments are actually in the same building. So based on this description you might expect that their energy use would be very similar. But in fact when comparing their June electricity bills it turns out that one family's energy use is nearly twice that of the other. This example illustrates the importance of the human dimension that buildings don't use energy, people do.

[Next slide]
This is just an illustrative example but in fact there's been a number of research papers recently that suggest that changing energy use behaviors alone can yield significant energy savings. In these studies researchers consider the impact of changes in household behavior and the likelihood that people will actually make those changes and estimate that household energy use could decrease by up to 25 percent. I should note that most of these studies also consider changes in personal transportation decisions as well as those decisions within the household that I've described earlier.

So nevertheless it's clear that behavior matters and that the potential energy savings for motivating a change in behavior are large, yet behavior change is often overlooked even by many weatherization programs.

[Next slide]
The ultimate objective of low-income weatherization programs is to reduce the energy costs for those households. In an effort to maximize energy savings weatherization programs can use a more comprehensive approach that addresses not only the buildings

and the technology but also behavior. Most of you have probably heard of or experienced situations where energy savings from measures involved as part of the weatherization program were less than expected because of a change in behavior. So by addressing both technology and the behavior the potential energy savings will be larger, resulting in an even more effective weatherization program.

[Next slide]
Low income weatherization programs actually have a really unique opportunity to influence behavior. First, you're already working one on one with households to reduce their energy costs, so you're already engaged with a conversation with the household about energy. You can take advantage of this opportunity to also focus on energy use behaviors and habits. Second, low income households are actually receptive to the idea of changing their behaviors, habits and routines. Recent research shows that low income households are the most likely audience to make changes to their behavior because they're no-cost, compared to their middle and high-income counterparts who predominantly make energy efficiency investments to reduce their energy.

Before moving on I do want to recognize that moat weatherization programs do offer client education. While programs define client education differently. In general it's very different from the type of behavior change approach that we're going to discuss today. Client education generally involves training the household on measures installed in part of a weatherization program. There may be some discussion of energy bills. And if behavior change is addressed it's often in the form of providing tip sheets or brochures on how to reduce energy use.

The limitation of this type of approach is that research consistently shows that information alone, and in particular one-size fits all information like tip sheets are ineffective at changing behavior. People learn from the tip sheets but they don't actually change their behavior in response. So the types of behavior change programs that we discuss are programs that focus on developing an understanding of how energy is being used by the household and engages the household to facilitate a change in behavior.

[Next slide]
The framework we've developed has three essential components that will allow weatherization programs to effectively integrate behavior change into their program, and they are "know", "engage" and "enable". Know refers to the fact that programs need to develop an understanding of the unique characteristics of the household so they can tailor their program. Engage refers to the fact that programs need to facilitate a change in behavior rather than just telling households what to do. And enable refers to the fact that once you've developed an understanding of the households that have engaged them you can use motivational techniques to further enable the households to change their behavior.

[Next slide]
Next we'll discuss each of these three components in more detail, beginning with know.

[Next slide]
The first step to effectively influencing energy use behavior is to acknowledge that every household is different. By developing an understanding of the target audience the program can be tailored to the specific audience and as a result will more effectively motivate a change in behavior. Time and again research and programmatic experiences revealed that one size fits all approaches are ineffective and yet we see the same generic tips on how to save energy appearing over and over. So be effective the information has to be relevant and specific to the household. So to provide this type of information you first have to learn about the households.

Some of the things you should think about or some of the questions you can ask are how is energy being used in the home? What are their energy use habits? Which habits are contributing most significantly to their energy use? How many electronic devices are there? Is there perhaps medical equipment that's really leading to significant energy use. Another important question is what barriers does the household face in changing those behaviors and habits? Is it simply that the household doesn't know what to do? Or are there perhaps cultural barriers or cooperation issues among household members?

Finally, consider what the motivations are for changing their energy use behaviors. Is it strictly financial? Most weatherization programs help with financial savings when dealing with low income households but it may be that households are more motivated by other reasons such as a religious _____ to conserve energy, or a waste less philosophy. So thinking about all these types of questions will provide invaluable insight into the household's energy use behaviors and will allow programs to more effectively influence those behaviors.

[Next slide]
To give you an example of how knowing the audience can be helpful in tailoring a program Southern California Edison conducted a study to explore what cause high energy use among low income populations. And the expected outcome was that they would find that their customers simply lived in old homes with old appliances and without the means to improve the conditions. But somewhat surprisingly the study found that there were actually five distinct categories of customer segments, each with different reasons for high energy use.

The first category, what they call "hostage to domicile" is what was the expected outcome. These were old homes with old appliances and no means to improve. But this category only accounted for 24 percent of the high energy users within the low income population. So that meant that 76 percent of low-income households had other reasons for using a lot of energy.

The group "declining health or wealth" accounted for 27 percent of the population, and these were households -- these households typically had retired or disabled household members where the household was aware of their energy use but they needed the energy use for their health or disabilities. So for example a household may have an electric wheelchair and high energy use was the result of charging the wheelchair.

In the fifth box another example is what Southern California Edison calls the "divided household". And this accounted for 26 percent of the population. These households were typically larger households with more electronic devices, more appliances, and the biggest barrier to reducing energy use was simply cooperation between the household members.

So through this study Southern California Edison really realized that their program needed to be tailored, depending on which customer segment the program was targeting. For example for the divided households category Southern California Edison felt that they could develop educational materials that were targeted towards the adults of households, the teenager and children, addressing each of their individual energy uses. They also planned to discuss things like devices with parental controls such as thermostats with access codes for that particular customer segment.

[Next slide]
So next I'm going to talk about some of the characteristics that will help programs develop an understanding of the energy use behaviors of their target audience. To give you just a quick overview of what I'll be talking about you want to first begin at a high level and consider the physical characteristics of the household, what is the dwelling type: is it single family, multifamily or mobile? What is the climate region? Another thing you can consider is identifying whether the household is an owner or a renter and who pays the energy bills as this may impact energy use behaviors and barriers. And finally you want to learn about the socioeconomic and demographic characteristics of the household as this can also provide insight into energy use behaviors. And first you can look to the community identity to provide information about the household and then focus more narrowly on the household.

[Next slide]
For example, behavior change recommendations should vary with physical characteristics such as dwelling type and climate. Also in energy saving tips are geared towards single family homes but 44 percent of the households eligible for federal assistance live in either multifamily housing or mobile homes. Dwelling types will vary considerably across the nation by state, among communities and even in neighborhoods. So for example in California multifamily, low-income multifamily housing accounts for 41 percent of the housing stock whereas in Tennessee this number is only 29 percent. Oops, I got those mixed up: in California it's 29 percent; in Tennessee it's 41 percent.

But why might dwelling type be important in the context of changing energy use behaviors. Consider this example: apartment dwellers typically use shared laundry facilities, either in the building or at a retail location but single family household generally will have a washer and dryer within their home. So if you're having a conversation with households you would want to discuss energy use behaviors relating to washing and drying with the single family household but this type of conversation may not be relevant to a household living in an apartment.

Behavior change recommendations should also vary with climate region. As it turns out approximately one-third of low income households live in cold climates, hot climates and mixed climates. So why might climate be important? For example, if your program is in a mixed climate conversations about using windows for natural ventilation is likely to be different than if your program is in a hot climate or a cold climate. Also note that climate zones are going to vary considerably across the nation and as shown in the figure of Texas may even vary within states. So you may be running program where you encounter multiple climate zones and as a result your program needs to be adaptable and information needs to be tailored, depending on which climate zone you're working in.

[Next slide]
Knowing whether the households are homeowners or renters and whether they pay their energy bill may also be important. Renters generally have fewer options to change their energy use behaviors. For example, some renters may not have direct control over their heating and cooling. They may not have access to thermostats. If a household is not responsible for paying their energy bills they're unlikely to be motivated by the financial savings from changing their energy use behaviors. So you really need to work to identify other motivations for those types of households.

[Next slide]
In addition programs should consider socioeconomic and demographic characteristics of the household. Even knowing something like the average household income can help to design an effective program. So within the low-income category there's a broad income range going up to about $45,000 for a household of four. And we know that as income increases the number of electronic devices per household increases.

So if the weatherization program is working with a household at the high end of the low income spectrum they may want to spend more time discussing electronic devices compared to a program working with households that are at the low income range of the low income _____ spectrum.

[Next slide]
To fully understand energy use behaviors and habits and barriers you have to know the households on an even more narrow level. As I mentioned previously you can first look to the community to see if there's a community identity that can help provide insight into the household. For example if the community has mostly retirees the program may want to focus more on -- may end up focusing more on behaviors surrounding medical equipment. Or if the community is mostly immigrants you may want to explore if there are any cultural barriers or motivations to changing behavior.

Then becoming even more narrowly focused on the household think about how many people are in the household. What are their ages and relationships? Is it a family with teenaged kids or is it young adults living together? Is it a household with multiple generations of families? Are there any health issues or other special needs? Any information you can gather on household energy use behavior and barriers to changing that behavior will result in a more effective program.

To illustrate this further I'm going to present a brief scenario.

[Next slide]
Suppose as part of the client education component of a weatherization program the educator suggested a household air dry their clothes outside to save energy. Now the household has a clothes dryer and does use it regularly so the recommendation is relevant and has the potential to be effective. But there may be a number of barriers that this household faces which prevent them from air drying their clothes outside. The climate may be humid or wet making drying clothes outside less practical. The households may dislike the feel of stiff clothing or be concerned about fading in the sunlight, or the household may be concerned that their clothes will be stolen if they're dried outside. Any one of these may make the recommendation ineffective.

But by learning about existing behaviors and the barriers to changing the behaviors educators can provide information that's not only relevant but can actually be achieved by the household. For example if the concern _____ the barrier, indoor drying racks could be discussed as an alternative.

[Next slide]
The Sustainable Living Project is a pilot program targeting recycling behaviors, water use behaviors and energy use behaviors. I want to briefly mention this program because it illustrates how knowing your audience can help you tailor your program. This program is being implemented in the Wellstone apartment building in Minneapolis, Minnesota which is a green building by design but had unexpectedly high energy and water use bills.

After running diagnostics on the building it was clear that it was behavior that was playing a major role in how energy and water was being used. For just a little bit more background: most of the residents in the building are low-income and most were immigrants from East Africa. And because of the culture of the target audience

[Next slide]
this program decided to conduct household interviews to gain more information and tailor their programs to the households.

So some of the things that they found through their household interviews were that their religion teaches them to use only the resources they need, so the program can try to appeal to this motivation to conserve water and energy rather than just appealing to financial savings. Another interesting thing that they found was that some of the recycling imagery they were using contained images of wine bottles which was found to be offensive. So they were able to take those out of their images and ensure that they weren't offending anybody. Also, they realized that due to language and cultural barriers they really needed to have someone who could relate to the target audience, so they involved some residents to help them advertise the program and talk about the program with the households. They also had an interpreter available for all meetings, workshops and things like that, and they also provided -- the program materials they provided were

translated. The image you see here is their energy computations pledge which is translated into _____.

[Next slide]
To end this section I just wanted to discuss a few methods that programs can use to help learn about the target audience. We've recognized that many of the weatherization programs out there are already very familiar with the households and communities they work with, so this is really a guide for those of you who maybe don't have that knowledge base and may benefit from ideas and resources on how to get started.

To begin, the methods we first talked about are very broad, will provide very broad, high-level characteristics about the household. And then we move down to methods that provide much more detailed information about the household. And one thing to keep in mind is that as we go down this list the methods definitely become more resource intensive. So just starting at the top one thing you can do is rely on government agencies that already interviewed households in the area you're working in. So for example the United States Census Bureau collects socioeconomic and demographic data. As an alternative you can identify community development agencies or other organizations that work in the areas that you are working in and that are familiar with the audience. Some states have associations of community development corporations which could be a good starting point for identifying what organizations are in the area. Action Without Borders is very similar as well; you can search by geographic location. And Habitat for Humanity is just another example of a national organization that has local chapters who generally are very familiar with the communities that they work in.

So beyond working with organizations you can then go to the community level and identify community or opinion leaders who can provide insight into energy use behaviors, barriers, motivations to that specific community. And finally, at the narrowest level you can conduct focus groups, household surveys and interviews.

[Next slide]
So that ends my portion of the presentation; I'm going to turn it over to Amy who will introduce my colleague, Wayne Tomac.

Amy Hollander:
Thank you, Dr. Baker Brannan for that interesting information. Before we proceed I just want to take this opportunity to encourage the audience to submit questions using the box in the upper corner of your webinar screen. You may have to click on the red arrow to show the questions box. We will discuss the questions at the end of the webinar, so I encourage you to _____.

So now I'd like to introduce our next speaker who is Wayne Tomac. Wayne is currently a PhD student in sustainable design and planning at the University of Colorado Denver and a graduate research assistant at the Renewable and Sustainable Energy Institute. His current research focuses on how to achieve the implementation of sustainable planning goals through a focus on consumer demand in real estate markets. He has an extensive

background in community engagement, development and planning in communities from Colorado to Thailand, and managed a number of successful community planning trips in the New York City region. Thank you Wayne, and feel free to take it away.

Wayne Tomac:
All right, thank you very much, Amy.

[Next slide]
So as Debbie outlined in the know section the first step to influence behavior change is to gain clear understanding of your target audience so you can tailor your program, the information you provide and how you provide it. However, tailoring the information won't lead to behavior change on its own; you also need to engage a household in the program so they are involved and interested in changing their behavior.

The three steps that we'll discuss to successfully engage the household include acting as a facilitator rather than as a trainer, what methods of community are effective in engaging households. And then we'll review some of the basic principles of communication that are important to keep in mind.

[Next slide]
The first step to engaging a household is to design or adapt your existing program so that you act as a facilitator rather than just a trainer or a client educator. As a facilitator you provide support and assistance to the household to help them better understand the relationship between their behavior and energy use. Rather than telling them what they should do, involve the household in the process by engaging them in a two-way conversation about their behavior and their unique context, barriers and motivations, continuing to provide guidance as needed. This back and forth conversation will allow you to problem solve with the household and to actively involve them and identify solutions that make sense specifically to them. This process will also help the household take ownership over their behaviors and energy use, something that doesn't typically occur through training or education programs.

[Next slide]
The insulation of programmable thermostats is a common measure included in many weatherization programs. Acting as a trainer program staff typically show the household how to use the thermostat. This was an approach typically referred to as client education, however this approach does not effectively address barriers to using the programmable thermostat directly. For example in some households people work opposite shifts, meaning that someone is always home. So telling the household to turn down the thermostat when they go to work is not useful. Or health issues may require the temperature to stay at a constant level.

Engaging the household will help identify these types of barriers and allow program staff to work with the household to find out what time and temperature settings are likely to fit their specific schedules rather than providing a one-size fits all information.

Another barrier might be remembering how to use the device. In this case try telling them how to program it, then show them how to program it, and finally have the reprogram it again on their own. If possible check back with the household at a later time, or on a later visit to make sure they remember.

[Next slide]
In addition to being a facilitator there are some methods of communication that will help engage the household on a more substantive level. One of the most effective approaches is to engage a household multiple times, before, during and after the actual weatherization takes places. Engaging the household more than once will not only help you learn more about the household but also help build trust between the household and the program staff, not to mention making it easier to understand barriers and identify solutions that work for their unique situation. And the more the household trust program staff the more comfortable they will be working with you to identify effective solutions.

It's also important to recognize that most energy use behaviors are habitual, meaning that people act it out, thinking about what they're doing. So the more times you interact with the household and can encourage them to think about improving their behavior the more likely it is for old habits to be replaced with new habits.

There are some weatherization programs who are already including these types of techniques such as the University of North Carolina at Charlotte who's making multiple home visits and phone calls to make communication with households before, during and after the actual weatherization services and have developed trusting relationships where household feel comfortable talking with program staff about issues even unrelated to energy.

[Next slide]
Successfully engaging households will also be more effective if you use multiple forms of communication. Your target households will not be exposed to every form of outreach you use. So if you use three different types of materials, let's say printed brochures, radio ad and community meetings you should assume that each household will only be exposed to one or two of those methods. Likewise, if you use only one method it's likely that a good portion of your target households won't be exposed to it at all.

And as you can see in the slide different methods of communication also have varying levels of effectiveness, with printed materials being the least effective and one on one conversations being the most effective on the right. The key is to find a balance between the methods used, how many you use, and the cost effectiveness of each method.

[Next slide]
Typically face to face communication will occur between household members and program staff as the household progresses through the weatherization program. A number of weatherization programs are already using innovative techniques to engage households in face to face conversation such as in Vermont, where they're using energy

efficiency coaches to work with households one on one to identify and encourage long-lasting changes in the behavior.

An even more effective approach than relying solely on program staff is to recruit trusted people who already established in the community that households may look to for advice, or as an example of what they should be doing.

Trusted messengers can take many forms. For example, they may be members of a local organization such as Habitat for Humanity that you can partner with and train to have behavior change conversations with households. Or they may also be an outspoken or vocal member of the community that you can also train to have those conversations.

GO is an organization in North Carolina that trains people from the community to complete weatherization services. But this model could be easily adapted to address behavior change as well. The reason this type of approach can be even more effective than using program staff to engage the household is that there is already a level of trust and buy-in between the household and the local messenger.

[Next slide]
A less formal but highly-effective way to leverage existing relationships is to encourage households to share their experiences and learn from one another. A few possibilities to facilitate this might include identifying some members of the community to serve as liaisons. This could be the trusted messengers as well. And these liaisons would give households somebody that they can go to that they're familiar with and comfortable with maybe more so than program staff who can continually have those conversations about good changes in their behavior.

Another example would be to provide coloring or activity books that will help engage children and teach them about their energy use or your program can sponsor events after weatherizations have taken place that will help remind people about good energy use behaviors and how to reduce their energy use. Incorporating this type of social interaction around energy use behaviors will encourage longer-lasting change.

[Next slide]
To close out this section on engaging households we wanted to provide a few _____ about effective communication techniques. First of all, don't overload the household. There's a tendency to want to provide as much information as you can because you have limited opportunities to actually interact with the household. However, too much information will make the household feel overwhelmed and they may see reducing their energy use as an insurmountable problem. Instead, be selective about what you choose to discuss with the household. Choose three to five topics you think may be most effective based on what you know about the household, how they actually use energy, and what is realistic for the household to achieve, given those specific barriers and motivations.

Secondly, keep education and information simple and non-technical. Often the technician doing the weatherization services is also talking to the household. But they

may have a tendency to use technical terms or energy lingo that the household doesn't understand. The same can happen with program staff used to talking about the utility of energy. This often leads to confusion in households feeling overwhelmed. For example it is typical to speak about kilowatt hours, but mostly people don't really understand what kilowatt hour is, nor how to contextualize it to their own use. So in this case it may be more effective to use dollars spent and saved rather than kilowatt hours if possible. So use language and examples households are sure to understand, but remember they are _____ don't be too simplistic either. And also be ready to provide additional information if the household does request it.

It's important to note that these principles apply to any form of communication, whether it's through printed material, TV advertisement or in conversation.

[Next slide]
On the screen we have a few different examples of printed materials that different programs have used. On the right you see materials that are a little bit more complicated. The bottom image is a lot of text and somewhat intimating to households; the top image has a nice image to it but there's so much going on on it that it's confusing to people.

On the right hopefully you can tell the images are a little bit more easier to understand. They use very simplistic images, short but clear text descriptions so it's easy for households to understand what the information is trying to be portrayed to them. And remember again this applies to all materials you would use, not just printed materials.]

[Next slide]
To wrap up this section we wanted to highlight the _____ in a pilot program called PowerSavvy in Queensland, Australia that is successfully using some of the techniques we've discussed to engage households. In this program advisors made in-home visits. They recruit people from the community to act as energy advisors, and the program also uses a broad strategy _____ multiple sectors such as schools and commercial combined with a large marketing effort to ensure everyone in the community became aware of the program they wanted to become involved.

One participant said, "What I liked most about the PowerSavvy program is they came to me, they asked me what I wanted rather than telling me what I should be doing. So it was initiated by me, and you feel ownership over it."

Some of the preliminary results from the program show participation rates over 60 percent and reported energy savings of 16 percent.

[Next slide]
So once you know and have engaged a target audience you can also increase the effectiveness of a program by using motivational techniques to enable the household to change their energy use behavior.

[Next slide]

The motivational techniques we're going to discuss today have been shown by researchers in the behavioral sciences to be effective at changing a wide variety of behaviors, including those relating directly to energy use. However, it's important to recognize that using these techniques without first understanding and engaging our audience will not be as effective. In this first question we'll review the most relevant techniques to weatherization programs including commitments, goal-setting, prompts, feedback and social norming.

[Next slide]
To begin with research shows that people have a need to be internally consistent with their attitudes and self-perception. So if a person says that they'll behave in a certain way they are much more likely to follow through. One study provides a particularly clear example of this phenomenon where a researcher _____ sunbather and set his towel and radio down next to a stranger, and then had a short conversation with them. Later, he left his towel and radio there and took a walk on the beach and second researcher, posing as a thief came and stole the radio and the towel. In that scenario only 20 percent of the time did the stranger actually run after the thief. However, when the researchers changed it up and asked the stranger before they left to watch over their things in 95 percent of the time the stranger ran after the thief.

So weatherization programs that can take advantage of this opportunity by asking households to make a voluntary commitment or pledge to reduce energy use or change the energy use behaviors. You can see on the screen that there is different levels of effectiveness based on the commitment that you see, with verbal being the least effective commitment and a written commitment that you then publicize, perhaps on a website or a local newspaper being the most effective.

[Next slide]
Commitment can be strengthened by having the households set specific goals. All goals need to be challenging to the household but also achievable because if the goal seems too difficult or too easy the household may not take the goal seriously.

For example asking households to set a goal of reducing their energy use by half may seem impossible for them, while just asking for a commitment to reduce the energy us doesn't provide the household a target to work towards or accomplish. Instead get the household to commit to air dry every other load of laundry, or unplug specific high energy appliances when they're not in use.

Goal setting will also be more effective if you provide households with the tools they need to reach the goal. This might include informational materials but we sure to also provide a tailored guidance on how to achieve that goal.

[Next slide]
As I mentioned before many energy use behaviors are formed out of habit meaning that the individuals act without thinking about what they're doing. So even if a household decides they want to change a behavior remembering to do so becomes an additional

barrier. In this case prompts can serve as remembers to households to target behavior, but to really be effective the prompt needs to be positioned where the action occurs.

Some examples you may be familiar with include messages on light switches reminding you to turn the lights off, stickers on a calendar reminding the household when to change their furnace filter or a note on the washing machine, reminding them to use cold water.

[Next slide]
Providing feedback to the household about energy use is a technique that has become very popular today and many weatherization programs are already integrating feedback through the inclusion of in-home energy displays. Feedback can be effective because energy use is essentially invisible to the household that only receives information about their energy use in an aggregated form at the end of the month. This makes it very difficult to understand how to reduce energy use through behavior changes and has been equated to buying groceries but only receiving a lump sum bill at the end of the month.

The chart on this slide illustrates research showing that feedback received only weekly or daily can lead to an average of 8 percent electricity savings and just disaggregated real time feedback can increase the average savings to 12 percent. If feedback is part of your program it's important to remember the communication principles we went over earlier. For it to be effective the household needs to be able to clearly understand and relate to the feedback in a way they can connect to a behavior change.

[Next slide]
While households are increasingly getting feedback on their energy use your program can increase the effectiveness of this feedback by conventionalizing the use in a social context because people also want to be consistent with the community and peers. I'm sure many of you are familiar with Oppeuer's work with utilities and home energy reports comparing a household's energy use to their neighbors. This social comparison alone has been shown to reduce energy use by 2 percent.

Less resource-intensive examples would be to publicize the household's energy use or energy saving behaviors in a local newspaper or website or on a yard sign, of course with their approval.

Other households in the community can serve as point of reference and motivation to improve their own behavior so that they may remain consistent with their neighbors. The Green Home yard sign on the bottom right of the slide is an example being used by the California non-profit Action for a Healthy Planet. Weatherization programs already using the neighborhood approach to social norming include the New Hampshire Community Loan Fund and there's a community organization in the Shanahan Ridge Neighborhood in Boulder that collectively got together to set goals for reducing their energy use in greenhouse gas emissions.

[Next slide]

Finally _____ it is important to know that these motivational techniques are more effective when combined. For a detailed example that illustrates the importance of knowing, engaging and enabling a household let's go back to the two similar families we began our webinar with, focus on reducing the energy use by the second family. All ____ motivational techniques that I just mentioned can easily be combined to one program to serve this family.

The second family consists of Lisa and her three children who live in an 850 square foot apartment. For the sake of the example we'll assume our family has a stackable waster/dryer in their apartment unit and that their neighborhood has no external barriers such as concern over _____ or a humid climate. The three children _____ habit of washing and drying clothes twice a week, _____ being significantly to her high energy use.

A weatherization program focusing on behavior change might take the following steps after getting to know the household and engaging each of them in conversation to understand why they're cleaning clothes so often. So begin, the program staff encourages Lisa to start washing clothes in cold rather than hot water. They also discuss the benefits of air drying clothes, _____ the energy savings and working with Lisa to resolve any additional barriers such as identifying convenient _____ convenient location _____ air dried.

Because she makes a set monthly payment for water to her landlord Lisa is not motivated by the idea of washing clothes in cold water, so the staff member instead focuses on the air drying option. Lisa is responsive to air drying because it will reduce their monthly energy bill. So the staff asked her to commit to air drying clothes more often. She agrees and with the staff's encouragement she also decides to be _____ more specific but reasonable goal of air drying once per week.

Through conversation they're able to identify a Wednesday as a day to air dry because the kids are at school when Lisa typically does the laundry that day. The staff member then asks Lisa to sign a commitment that they will post on the program website along with other households in the neighborhood that are making similar commitments. She agrees with the clients, their request to put a sign on her apartment door stating her commitment. The staff then gives Lisa a simple magnet to put on the dryer door that reminds her to air dry on Wednesdays. The staff are also able to give Lisa an in-home energy display that converts kilowatt hours to dollars so that she can additionally see the difference in her energy use and cost when she uses the dryer versus when she air dries clothes.

After a month passes program staff check back with Lisa. She met her goal for the first month and has decided by the month she's saving based on the in-home feedback she's _____. However, she's considering discontinuing air drying because her children are unhappy that the clothes are stiff after air drying and they don't want to wear them. After _____ staff explain that she can put already air dried clothing into the dryer for just a

couple minutes to soften them without losing most of the energy savings she's excited and commits to air drying every load in the future.

The program staff publish her name in a local newspaper for achieving her energy reduction goal and Lisa agrees to have her name added to a lawn sign and her landlord has also agreed to temporarily put at the entrance of the building acknowledging Lisa's accomplishment and encouraging other people in the building to do the same.

This is an example of how to combine techniques into a cohesive solution that uses relatively low resource for the weatherization program with the exception of the in-home device. But that could be -- it would be easily implemented without the feedback _____.

We began this webinar by highlighting the fact that the human dimension of energy use is an important yet often-overlooked component of weatherization efforts. Changes in behavior alone can lead to significant energy savings and technology solutions in isolation can lead to a rebound effect that minimizes the energy use reductions. Weatherization programs have a unique opportunity to influence behavior because you are already interacting with the household and low income families have increased motivation to achieve energy reductions _____.

We've outlined the three-faceted framework, including knowing, engaging and enabling households that can be integrated into existing and future weatherization programs to achieve greater energy savings for low income households. Although this strategy may seem resource-intensive, especially for _____ programs many of the strategies we've discussed require only minimal resources and a little creativity can help create solutions that minimize required resources.

The more holistic approach a program can take, the more effective it is likely to be. However, each program will _____ to adapt efforts to the local context and resource availability.

_____ many weatherization programs are always trying to incorporate some of the strategies we discussed today. We hope this webinar is helpful in increasing the effectiveness of those programs while providing the tools necessary for other programs to develop a more holistic approach to weatherization that effectively incorporates the human dimension and even a greater energy savings. Thank you and we hope that this webinar is helpful in improving your programs.

[Next slide]
Thank you very much, Wayne, for those very interesting examples of slides. I'd now like to conclude the webinar by having a question and answer period. We've received some questions from the audience and the first question is for Debbie: "With limited resources what should an energy auditor or a weatherization crew focus on most to engage the resident in effective behavior change?"

Deborah Brannan:
Thank you, Amy. So if a program already has an energy auditor or weatherization crews going into the home one of the things that you can do is try to target one person who's going to be the point of contact with the household. By having one person engage and interact with the household this will be develop trust and so all of the information will be coming from a consistent and trusted messenger. All crews, including the main point of contact should be trained to be responsive observers, so paying attention to what is actually happening in the household and in this way they can really target the behaviors that will work for that family.

Part of this is going to be also being a good listener so that you can facilitate behavior change. So really if you're already in the household just make sure that you're engaging in a two-way conversation with the household to try to provide informative and relevant information.

Amy Hollander:
Thank you Debbie.

[Next slide]
With that I want to close by thanking the University of Colorado's Renewable and Sustainable Energy Institute, known as RASEI and the U.S. Department of Energy.

[Next slide]
If you have any questions for our speakers, Dr. Debbie Baker Brannan or Mr. Wayne Tomac, or if you are seeking additional information on this topic

[Next slide]
please email me at Amy.Hollander@NREL.gov.

[Next slide]
With that I'm going to close and wish you all a good day from the National Renewable Energy Lab in Golden, Colorado.

[End of Audio]