Technical Assistance Program

Residential Retrofit Program Design Guide

May 2011

Contact Information:

Ken Tohinaka, VEIC
ktohinaka@veic.org
(802) 658-6060 ext. 1014

Nikki Kuhn, VEIC
nkuhn@veic.org
(802) 658-6060 ext. 1312

Richard Faesy, EFG
rfaesy@energyfuturesgroup.com
(802) 482-5001

Dan Quinlan, VEIC
Technical Assistance Program Team Lead
dquinlan@veic.org
(802) 658-6060 ext. 1177

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1. Introduction

This Residential Retrofit Program Design Guide focuses on the key elements and design characteristics of building and maintaining a successful residential retrofit program. For the purposes of this Design Guide, "residential retrofit" is loosely defined as installing measures or equipment in existing homes in order to increase the energy efficiency of these buildings. A high level of focus has been placed on existing buildings recently, and for good reason, as existing residential and commercial buildings account for approximately 40% of energy consumption in the United States. Additionally, work that addresses residential energy retrofits is inherently local, building local economies and providing local jobs.

This Design Guide is intended to be a living document, focusing first on providing basic context and guidance, and later building additional content and linking to helpful resources as they are identified and/or developed. The information presented here will – in large part – be common to all those interested in retrofit programs. However, successful program design and implementation will likely generate questions and issues that require focus on the specific location and circumstances, so seeking outside expertise can help the reader work through those specific issues.

This Playbook will take the reader through the essential elements of designing, implementing, and evaluating residential retrofit programs. The material is presented as a guide for program design and planning from start to finish, laid out in chronological order of program development. However, it is important to note that successful programs will see this process as circular and ongoing, rather than linear, and these steps will be continually operating in order to optimize program success.

EECBG, SEP and BetterBuildings Grantees

For Recovery Act grantees, this Guide is intended to help you identify specific needs that can then be addressed through requests to the Technical Assistance Network (TAN), available through DOE's Solution Center at http://www1.eere.energy.gov/wip/solutioncenter/.

The highest level essential elements in energy efficiency program design are as follows:

- **Assess** the existing community and market conditions within which your residential retrofit program will operate.
- **Plan** around what the existing conditions dictate, allocating resources to any gaps or deficiencies, and leveraging existing resources that will help strengthen and sustain your program.
- **Implement** your program, either as a fully launched, large scale program, or as a pilot as appropriate, ensuring you have the necessary program support, both for contractors and customers.
- **Evaluate** your progress and results along a variety of criteria that you identify as important to your program and community (energy savings, jobs, sustainability, etc.), and use that feedback information to adjust and re-assess your approach on a regular (daily, weekly, monthly, quarterly, annually, etc.) basis.

ASSESS

PLAN

EVALUATE

IMPLEMENT
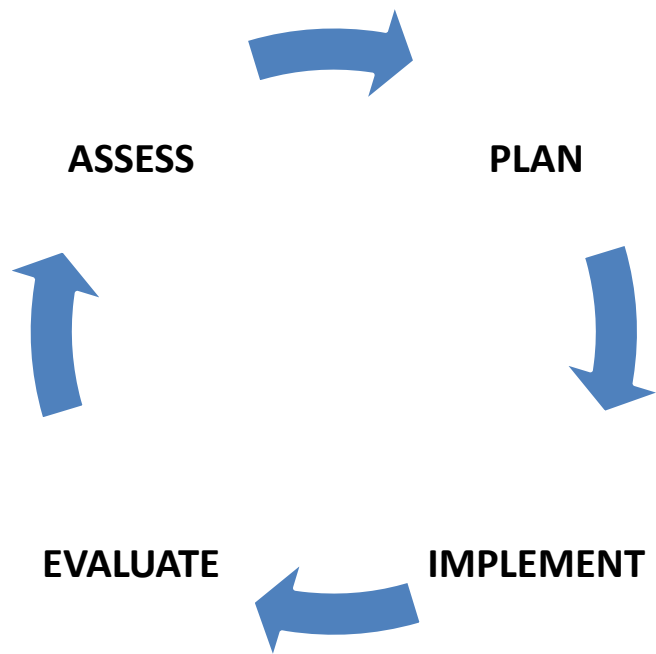
2. ASSESS

Before embarking on any new program, or expanding an existing program, it is important to understand its parameters and the environment in which it operates. This includes the program's local market, the extent to which other programs and potential resources affect this market, and the relevant resources that are available to this new or expanded program. In addition to assisting in developing adequate program delivery infrastructure and optimizing savings, the market assessment information will assist with meeting job creation and sustainability goals as well.

This section will outline the various areas you should look at when assessing your community for a residential retrofit program, which include the following:

- Characterize the Market
- Identify Existing Programs & Leveraging Opportunities
- Assess Existing Contractor Resources

2.1 Characterize the Market

There is more to characterizing the market for a retrofit program than to just say that it is for all households in a jurisdiction. The more that is known about the market, the more the program design can be tailored to respond to local conditions and generate optimal outcomes. Some questions that deserve detailed answers follow:

2.1.1 Demographics

How many households are there?   How many are qualified for existing low-income programs? How many are getting housing cost assistance? How many participate in other social service programs? What is the ratio of owned vs. rented?

U.S. Census data provides household statistics at the county level, including number of households, median income and number of households living below the federal poverty level, which will give you an initial snapshot. You may need to reach out to other sources if you are seeking municipal data, such as municipal housing authorities and economic development departments, and local organizations providing assistance to lower income households (local Weatherization Assistance Program agencies, social service programs that distribute Low Income Home Energy Assistance Program utility bill assistance, local food banks, etc.).

Also, it is necessary to understand the distribution of home owners and renters. For rental properties, programs and incentives will need to be targeted differently to impact property owners, who do not necessarily reap the economic benefits of decreased energy costs due to efficiency improvements (called "split incentives").

2.1.2 Climate
Is it a heating climate, a cooling climate, or both?

Understanding your climate will help to identify what types of energy improvement measures to incentivize (e.g. radiant barriers, solar hot water systems, depth of insulation, equipment with different efficiencies, etc.) as well as begin to give information about their cost effectiveness (i.e. will the energy savings be greater than the cost of the improvements over their lifetime). When climate data is paired with heating/cooling fuel source and cost data, cost effectiveness of individual measures and packages of measures can begin to be assessed.

2.1.3 Housing Stock
How many different building types are there in the community? How many single family buildings vs. small multi-family vs. large multi-family? What is the average age of the different housing stocks? Are there any common characteristics among the different housing types?

Understanding the type and age of the housing stock in your area will help you identify what types of programs and measures will be most effective and which should be promoted in your program.

2.1.4 Consumption by Fuel Type
What is the average household consumption by fuel type? What is the average energy consumption by housing type? What about the typical household consumption of those using fuel (such as oil or propane) for heating/cooling?

Knowing the different fuel types and their costs will help identify which measures to emphasize and which will be most cost effective, but it is important for a variety of other reasons, as well. Consumption levels can be an indicator of the current status of the communities' housing stock in terms of efficiency. Knowing fuel types can also help you identify potential resources to leverage (e.g. natural gas providers with existing efficiency incentives that your program can help customers to tap).

2.1.5 Major End-use Equipment
What is the proportion of furnaces vs. boilers vs. heat pumps vs. electric resistance heating? What about the subset by fuel type for furnaces and boilers? How often are central air conditioners (CAC) vs. room/window air conditioners (RAC) used? What is the domestic water heater fuel and type? What are the typical electric energy major end uses?

This takes the preceding question to a more granular level in identifying which measures/packages of measures will be the most effective in reducing energy consumption. Additionally, knowing this information may help you leverage resources if your program can help to reduce peak load or overall energy use for a utility that has demand side management requirements.

2.1.6 Utilities and Rates
Are there different gas and electric utilities in your area? What are the utility rates and rate structures?

Understanding the different local utilities and their rate structures can help you determine how to target retrofit improvements and identify utilities to target for leveraging participation.

2.2 Identify Existing Programs & Leveraging Opportunities

Most jurisdictions have some sort of existing resources devoted to improving household energy efficiency. The question is less a matter of what those resources are and more a matter of how to leverage and integrate them. There also will be both common and unique challenges. Here we will identify the common places where programs exist and leveraging may be advantageous, and some areas where it might make sense to ask additional questions in seeking out those resources that could help enhance your program. It is also important to note that, in some jurisdictions, any or all of the resources identified below may have programs run through third party program administrators.

> **Potential Municipal Program Allies**
>
> - Water utility
> - Community land trust
> - Home improvement program
> - Affordable housing program
> - Lead paint program
> - Waste/recycling services
> - Smoke detector or carbon dioxide (CO) alarm program
> - In-home interaction (e.g. Meals on Wheels, home health, visiting nurse, etc.)
> - Town permit office

2.2.1 Utilities

Utilities provide the greatest opportunity for leveraging and partnering to pull resources into a retrofit program. Utility programs are typically restricted to their rate payers, and may further be restricted to measures that relate to the fuel type they provide. For instance, an electric utility company may provide incentives only for those measures that address electric consumption, whereas a gas utility may only incentivize gas efficiency measures. Also, utilities are often required to provide energy efficiency services or special rates to their low-income customers.

Once existing programs are identified, it is appropriate to consider focusing on those households that are underserved by utility programs. For example, one immediate issue arising from utility programs is what to do about those whose energy costs are included in their rent. (See sidebar in Plan section for further discussion on the landlord-tenant split incentive issue).

Additionally, as utility programs are often restricted to the energy source the utility delivers, focusing on the other energy sources may make sense. Also, it may be desirable to both the municipality and the utility to have a program serve as a single public face and aggregator of these individual measures. This would also enable the community's residential program to incentivize comprehensive retrofit packages, and may help to augment the utility's efforts if they are narrowly focused, resulting in both broader and deeper energy savings.

2.2.2 Municipal Programs/Initiatives

Municipalities typically administer and support many programs which also address at least some of the same households being targeted by the EECBG or SEP-funded programs. They needn't be energy efficiency programs to be important potential allies. For example, there may be a municipal program designed to ensure that each household has a functioning smoke detector or CO alarm. Or a municipal water utility may have incentives for low flow toilets and/or high efficiency clothes washers. These can be terrific ways to initiate entry for an energy efficiency program, as well as possibly leverage additional resources. Identify any programs that engage constituents in their homes (where energy efficiency opportunities may be identified) and have a high degree of trust within the community they serve.

Word of mouth is probably the most effective means through which to grow program participation, so you will want to start thinking about how to ensure that other municipal program staff people are knowledgeable about the program you ultimately roll out. Once the program has some demonstrated successes, these partners can also become champions to greatly enhance your efforts.

> **Babylon, New York: Creative Leveraging to Finance Energy Efficiency through Waste Services**
>
> A good example of an innovative approach to leveraging a municipality's connection to its residents is in Babylon, New York. Babylon creatively used its bonding authority to raise capital for energy improvements and made those funds available to individual homeowners for energy improvements through their property tax assessment. They then used their trash collectors to promote their energy efficiency program by leaving door knob hangers when picking up waste.

2.2.3 State

A partnership with the state low-income services, such as housing assistance and other social services, or the state housing finance agency/authority can be beneficial. For example, clientele who do not qualify for the low-income program might want to participate in a residential retrofit program that is not income-based. Vice versa, clientele might apply for the retrofit program when they could be better served by free services.

> **Potential State Program Allies**
>
> - State Energy Office
> - Utility regulators
> - Code officials
> - Housing Finance Agency/Authority
> - Low Income Program

2.2.4 Federal

There are, of course, various existing and potential forthcoming federally sponsored programs, as well. They include:

- *The Department of Energy's (DOE) Weatherization Assistance Program (WAP)*: WAP is the longest lived and most prominent federally sponsored energy efficiency program. This program is open to households meeting income-eligibility criteria established by each individual state as approved by DOE. Requirements are typically 200% of the federal definition of poverty, which is revised annually, or 60% of local median household income. At no cost, WAP participants can receive installation of efficiency measures which are deemed cost-effective (per the state's DOE approved energy auditing tool), but within the scope of the overall budget may be enhanced by other resources, such as utility program funds. Any retrofit program would do well to work very hard at ensuring maximal integration with WAP, such as through providing direct financial assistance, apportioning the potential participant pool,

or devising some other strategy to ensure coordination of services. Another way a retrofit program may integrate with WAP is through leveraging of shared, necessary resources, such as workforce, standard work practices, training and quality assurance. Tapping into the pool of certified WAP contractors to support a larger home retrofit program, for example, is a great opportunity. Identifying how to assess and develop the workforce for a residential retrofit program will be discussed in greater detail below, but this is a good time to start to gauge the available resources in this arena. More information on WAP is available at: http://www1.eere.energy.gov/wip/wap.html.

- *Home Performance with ENERGY STAR (HPwES)*: The Environmental Protection Agency (EPA) sponsored HPwES program is designed to encourage retrofits that consider the entire building, rather than individual measures. Some jurisdictions have an established version of the HPwES program; others are in the process of establishing one. Typically, these programs are utility sponsored, but they also can be municipally or state sponsored. The EPA also has recently completed a pilot in Northern Virginia to allow individual contractors to participate even in areas without a sponsored version of the program.   While EPA does not place restrictions on household eligibility, local versions of the program tend to have parameters on the extent to which direct and indirect incentives are available for participating households.   The degree to which the EECBG program or incentives can leverage these existing incentives and program parameters is an important consideration that will be covered further below. More information on HPwES is available at: http://www.energystar.gov/index.cfm?fuseaction=hpwes_profiles.showSplash.

  Also of note, HPwES contractors must hold appropriate credentials (e.g., Building Performance Institute (BPI) Certification or Accreditation).   And the program must provide robust quality controls such as those accompanying BPI Accreditation. Thus, an existing HPwES program may also signify available resources for your program to tap in the areas of training and workforce.

- *Federal Retrofit Incentive Program:* Residential retrofit programs would do well to consider making their efforts compatible with "Home Star", or any other federal legislation related to energy efficiency that could provide program resources, and be prepared to take advantage of them.
  The Home Star legislation has been pending for some time, and it is still unclear whether it will be passed, what the final version will look like, and if it will be signed into law. However, some version may be enacted, which would mean resources for incentives for individual products ("Silver Star") and for comprehensive, whole-house retrofit measures ("Gold Star"), as well as some possible financing components. Attention also should be paid to the likely "tiering" of incentives for the Gold Star component (i.e., the more comprehensive the effort, the more lucrative the incentive) and a minimum overall savings requirement, which is all the more reason to be comprehensive in developing retrofit program efforts.

- *Home Energy Labeling/Rating Programs:* DOE has recently announced a national pilot program ("Home Energy Score") to provide energy efficiency labeling for existing houses which will be piloted by a handful of communities. This effort joins at least a few other existing rating efforts (EPS and HERS; see sidebar). Any of these rating initiatives may help ease entry into the HPwES and Home Star efforts, as well as other retrofit programs, because they raise awareness among consumers of building energy performance. By presenting a home's performance in a single score, rating and labeling can be an effective means of simply quantifying what can be a complicated set of individual building elements. However, you need to be aware of the potential confusion of having more than one scoring system in a marketplace and the need to consumer education if this comes about.
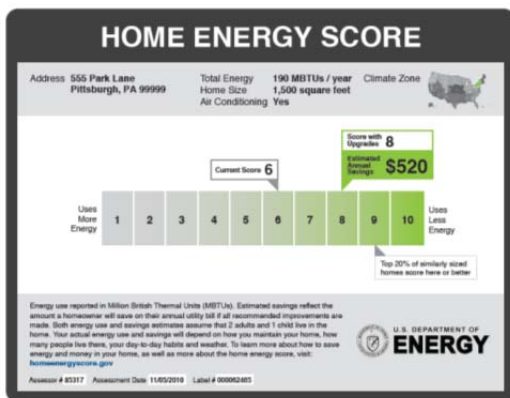
Building Labeling/Rating Initiatives

- Home Energy Score: DOE's pilot program using a simplified home assessment tool that produces a building score of 1-10, with 10 as the "best".
- Energy Performance Score (EPS): Earth Advantage's absolute energy score using a simplified home assessment tool that produces a score with the best at 0 (zero purchased energy) and the home's score representing the absolute amount of energy (typically in kWh or MMBtu per year) a house is projected to use under typical operating conditions.
- Home Energy Rating System (HERS) Energy Rating: RESNET's detailed energy rating that produces a relative rating for a home compared itself as if it were built to 2006 code. A home with those code features scores 100, a home that uses more energy scores higher, and a home with zero purchased energy would score 0.

In addition to being useful as a way to quantify the work conducted on retrofitted homes as a "leave-behind" by a contractor or auditor, a home score can also provide useful information on the energy efficiency of homes for sale and purchase. A "time of sale" initiative put in place by a community can be an effective means of spurring demand for retrofitting existing homes. If home sellers are required to disclose the energy rating of their home, the market will tend to encourage energy improvements by valuing efficient homes higher than inefficient ones. Buyers will demand home efficiency in their purchase decisions, driving home retrofits. Information on the Home Energy Score is online at: http://www1.eere.energy.gov/buildings/homeenergyscore/.

- *Workforce Guidelines for Home Energy Upgrades:* DOE is working to establish a set of Workforce Guidelines for Home Energy Upgrades. The Workforce Guidelines are intended to be used by states and municipalities seeking to increase the quality and effectiveness of home retrofit work and to be used by training providers to improve training curricula and other materials. DOE released a draft for public review in November 2010 that included four components. First was an analysis of the job tasks undertaken by workers when completing energy efficiency improvements. Job task analysis was done for four types of workers: auditors, installers/technicians, crew chiefs, and quality assurance professionals. Second, the Workforce Guidelines lay out the necessary knowledge, skills, and abilities for workers to perform home retrofit work. Third, DOE developed a reference guide to the technical

standards that home retrofit professionals should consult. Lastly, the workforce guidelines include standard work specifications, which define the necessary and sufficient conditions for high quality home retrofit work. As of May 2011, DOE was planning a second comment period before finalizing the Workforce Guidelines in late 2011 or early 2012. More information about this program can be found online at: http://www1.eere.energy.gov/wip/retrofit_guidelines.html.

2.2.7 Renewables and Energy Efficiency

While renewable programs and energy efficiency programs are markedly different, they also are importantly inter-linked. It makes little economic sense to pursue renewable resources if existing energy consumption is excessive. Given the high costs of renewable energy systems, it only makes sense to supply the minimum amount of energy needed to meet all of a customers' existing needs. Energy efficiency should be the first priority and once the load has been suitably reduced, modest solar and other renewable technologies can be appropriately utilized. Therefore, take note of any existing renewable energy programs and who they are serving (residential, commercial & industrial, community scale, or some other group) and identify whether there are ways to leverage the work they are doing to promote efficiency first, and possibly drive customers to the retrofit program.

2.2.8 Financing Options

There are a wide variety of options for financing energy efficient retrofits. The options you choose should reflect the goals of the program and the resources you can bring to bear. For example, in order to encourage deep retrofits (high energy savings, usually defined as 50% or more), the short-term financing arrangements typically offered are ill-suited since they don't accommodate the high cost of the work (often $50,000 or more for a residence) and don't allow for spreading of loan payments over a long enough period. Efforts have been made to overcome these obstacles through innovative financing options such as the new federal "Power Saver" national energy loan program (see sidebar).

While short-term financing does not suit everyone, it does fit some. All programs should be as hassle-free as possible. The evidence is that more hurdles and delays lead to less uptake and program participation. In one example, the local utility program offers both low-cost loans and cash-back options. Ever since allowing the cash-back incentive to be assigned to the installation contractor, there have been no loans taken. One conclusion which could be drawn is that program participants would rather come up with the remainder of the project cost on their own (even during an economic down-turn) then undergo the hassles/delays of loan approvals. However, even though there may be evidence of consumers taking cash incentives over financing, most home performance contractors will tell you that they need to have a financing option to offer homeowners in order to give them a choice. And, in

> **Some Financing Options**
>
> - HUD/FHA PowerSaver Loan: A new national "mortgage" pilot product designed for energy retrofits up to $25,000 with terms up to 15 to 20 years, available starting in 2011.
> - Specialty Home Energy Loans: Many states, utilities and local programs have special loan products for energy efficiency available locally with reduced interest rates. Qualifying criteria vary.
> - Home Equity Line of Credit: For those with equity in their homes, borrowing against the value of the home can potentially provide flexibility, lower interest rates and tax deductibility.
> - Credit Card: An easy and flexible way of financing moderate-cost energy improvements, but at the risk of typically higher interest rates.
> - For more in-depth financing program information, see DOE's Clean Energy Finance Guide at: http://www1.eere.energy.gov/wip/solutioncenter/

many circumstances, those customers who need the energy improvements the most are the ones without any access to financing and will need to take advantage of the program's financing product.

The DOE has dedicated significant resources to helping communities identify, develop and launch financing mechanisms. DOE's Technical Assistance Program's finance team has developed an extensive Clean Energy Finance Guide that can be utilized. This Guide is available on the DOE web site at: http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/financingoverview.html.   Additionally, community-specific requests for finance program assistance from DOE grantees can be made through this web site: http://www1.eere.energy.gov/wip/solutioncenter/.

2.3 Assess Existing Contractor Infrastructure

A residential retrofit program will go nowhere without people to perform the residential retrofit work. There are several ways to assess the depth of the contractor infrastructure in your area, as outlined in this section. And once you know your local contractor community, you can identify what resources you will need to dedicate to contractor training, establishing performance standards and quality assurance, all of which will be discussed in later sections. Following are some definitions and considerations to use in assessing your contractor infrastructure.

2.3.1 Certified Contractors & Building Professionals

Building Performance Institute, Inc. (BPI) is a non-profit organization which develops criteria around quality work practices, and trains and certifies individuals (vs. companies) as having some basic level of knowledge in a variety of categories. Currently, the certifications include Building Analyst Professional, Envelope Professional, Manufactured Housing Professional, A/C or Heat Pump Professional, and Evaluation Professional. Similar certifications for air sealers, insulation installers and their supervisors, as well as a specific certification for energy auditors, are expected to be available soon from BPI. Certifications stay with the individual and are valid for three years. Certification testing includes both written and field performance examinations.

> **Contractor Certification & Accreditation**
>
> There are two widely recognized non-profit organizations in the residential energy marketplace that certify individuals and accredit companies to assess and improve the energy efficiency of buildings:
>
> - Building Performance Institute (BPI)
> - Residential Energy Services Network (RESNET)

BPI Accreditation is offered to companies (not individuals). Accredited companies must employ an individual or individuals who possess at least two different certifications. In addition, the company must adhere to BPI standards and best practices in all of their work and agree to receive BPI QC inspections of work samples at a rate determined by their production volume.

The Residential Energy Services Network (RESNET) is an industry not-for-profit membership corporation and the body that establishes national standards for building energy efficiency rating systems. RESNET is recognized by the national mortgage industry and federal government for verification of building energy performance for:

- Federal tax credit qualification
- EPA ENERGY STAR labeled homes
- U.S. Department of Energy Building America program

RESNET accredits local providers (business and organizations) who in turn certify individual Home Energy Rating System (HERS) Energy Raters. RESNET Energy Raters and BPI Building Analysts are trained and certified to essentially the same building science standards. The only difference is that currently a BPI Building Analyst is trained to conduct a combustion safety test and a HERS Rater is not. This is changing in 2011 when both designations will be required to demonstrate the same level of building science and testing knowledge.

RESNET also designates "EnergySmart" Builders and Contractors who meet certain minimum criteria, have undergone training and passed an exam. While not as robust as the BPI accreditation criteria for contractors, the RESNET designation ensures some basic level of knowledge about building science and home performance.

Both RESNET and BPI have certain quality assurance standards built into their certifications and accreditations to ensure that their standards are followed.

At this point in time, RESNET and BPI are the most widely known organizations that develop standards and training, and provide quality assurance for the residential retrofit market. As you assess the existing contractor infrastructure, you should keep an eye out for organizations that identify themselves as affiliated with RESNET and/or BPI, as it may identify a level of expertise of the contractor base, a potential resource to leverage with your EECBG program, and built-in quality assurance mechanisms that you can use (rather than developing them yourself).

In addition to RESNET and/or BPI, another source of certified contractors is the federal Weatherization Assistance Program (WAP). As of February 2009, 31 WAP grantees required certifications for one or more types of WAP workers in their programs. For more information on WAP certifications, see the National Weatherization Training and Technical Assistance Plan at http://www1.eere.energy.gov/wip/pdfs/wap_tta_plan.pdf or the Weatherization Assistance Program Technical Assistance Center at http://www.waptac.org/.

In the future, another option for home retrofit programs seeking to understand the knowledge level of contractors locally will be to research whether contractors follow the Workforce Guidelines for Home Energy Upgrades that are currently being established by DOE.

HVAC Terminology

- Furnaces heat and distribute warm air via ducts. They are typically gas or oil fired.
- Boilers heat water and distribute via piping typically using gas or oil.
- Central air conditioning (CAC) typically uses ducts (often the same system as the furnace if there is one, but not always) to cool and distribute air using electricity.
- Ductless mini-splits are air conditioners that have an outdoor unit and indoor unit connected by pipes circulating refrigerant typically mounted high on a wall with a built-in fan to distribute cool air without any ducts.
- Heat pumps use similar technology as refrigerators to concentrate heat from outside ("air source") or from the ground (ground source") in the winter and move it inside to heat the house. In the summer they pull heat out of the air inside and dump it outside or into the ground to cool the house. These are electricity-powered and usually use electric resistance heat as back-up.

2.3.2 Auditors

Unfortunately, "audits" is a loosely defined term that means different things to different people. At one end of the spectrum are such things as online self-evaluations based on national or regional averages and databases. At the other end are site-specific investigations conducted by credentialed individuals armed with sophisticated diagnostic test instruments, which result in detailed and comprehensive work scopes.

Utilities, DOE and EPA often promote the former as a service easily provided to all their rate payers or the general public. HPwES requires the latter to ensure that the greatest value is provided to the customer. Efforts are currently underway by a variety of organizations, including BPI, RESNET, DOE and EPA, to distinguish between the various levels that the term "audit" can denote. Being considered are such differentiating terms as "clipboard," "online," "walk-through," "preliminary" and "comprehensive."

Similar to above, as you analyze your contractor base to determine the presence of auditors locally, indicators like BPI or RESNET certifications will give you information about the resources available to your residential retrofit program. To the extent these resources already exist, you should take advantage of them. If they don't exist in your market, you should reference national standards (i.e., BPI and RESNET) to ensure that your contractors are up to speed and the people delivering your program services are adequately credentialed.

2.3.3 Dominant Retrofit Players
While there are any number of different contractors that can touch a house in a manner that is related to its energy performance, they tend to fall into two basic camps: those that have something to do with the heating and cooling systems of the house (heating, ventilation and air conditioning, or "HVAC" contractors); and those affecting the building shell, or envelope, and thus the heating and cooling load of the house (envelope contractors).

HVAC Contractors: Heating, ventilating and air conditioning (HVAC) contractors are themselves typically further characterized by sub-specialties, although some do work in all areas. Regardless of specialty or range of services, an HVAC contractor is clearly poised to be a major player in any energy efficiency program. But they should not be viewed as simply contractors capable of installing new equipment or repairing existing equipment. The efficiency of the building shell (thermal load) should be optimized through air leakage reduction and insulation work *before* worrying about high efficiency HVAC equipment. Otherwise, energy is still being wasted, just a bit more efficiently. Further, a less leaky building shell may need a smaller sized HVAC system, and lower output equipment is less expensive than equipment with higher output.

Therefore, the trick is to ensure that HVAC contractors are aware of and coordinate with other contractors who are in a position to reduce the thermal load. This can take the form of simple promotional literature given to both contractors and customers at one end of the spectrum, to incentives that reward contractors who partner and promote deep retrofits at the other. BPI accreditation also effectively encourages this sort of cross-promotion, as does HPwES. So a contractor base with BPI accredited HVAC contractors and/or a mature HPwES program may indicate that HVAC contractors will need less training and coaxing to perform HVAC work with the whole house in mind. Whereas, few of these established resources may indicate a higher need for training and quality assurance.

Envelope Contractors: Typically, envelope contractors in the energy efficiency realm tend to be thought of as being either insulation installers or window installers. From the perspective of building science and cost-effectiveness, however, both should take a back seat to those contractors who identify and seal critical air leakage locations, a skill which takes more talent than simply caulking seams and installing weather-stripping.

Air Sealers: Starting in the early-mid '80s, much research and field experience showed that insulation by itself doesn't do much good, unless there is a continuous air barrier between inside and outside, and the insulation is directly in contact with this air barrier. Otherwise, the insulation is just a filter at best rather than a thermal barrier.
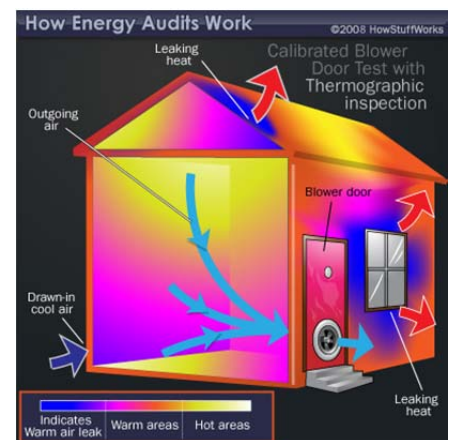
Any program that wishes to improve housing energy efficiency needs to start with the air sealing trade. Unfortunately, there are still far too few professionals who are capable of doing this work and doing it well.

Part of the reason is that it requires specialized equipment, such as blower doors (tools which create a measured pressure differential between inside and outside, and establishes the home's air leakage rate), digital manometers (allows measuring pressure differentials to include different parts of the house simultaneously to diagnose hidden thermal problems), and infrared cameras (cameras which show temperature differences on the surface of the house to identify where air is leaking in/out). The best performing programs include the capacity to develop this specialized trade through training and mentoring, as well as by requiring air sealing measures to be performed to program standards.

Insulation: Insulation contractors also have various sub-specialties. While fiberglass batt insulation is perhaps the most common form, there are other types of insulation and not all contractors are familiar with the alternatives, such as cellulose and foam. Further, these less familiar forms have the advantage of being able to be easily applied into irregular spaces, whereas batt insulation comes in fixed dimensions.

Not surprisingly, not all insulation contractors are well-versed in the art of installing cellulose to its greatest effect or foam in its various types. Further, of those who claim to install any and all kinds of insulation, far fewer are those who actually know what they are doing and do it well. Hence the need for some sort of screening process to ensure that program contractors provide the greatest benefits to both program and participant. Many insulation manufacturers now offer their own certification programs to ensure optimal performance. Program training, screening and quality assurance of work conducted can be an effective regimen to identify the better insulation contractors.

Siding: While new siding does not provide any appreciable energy efficiency benefits, contrary to some claims, its installation does provide an opportunity to have supplemental wall insulation installed. Although the typical wall is already insulated with fiberglass batts, it is often the case that additional insulation can be blown in to fill gaps between batt segments, and between the batt and the sides of the wall cavity. Additionally, sheets of high R-value insulation can be applied outside a house prior to new siding insulation to appreciably improve older homes' wall insulation performance. Since work is already being done on the home and contractors are in place anyhow, this can be an opportune time to reduce wall air sealing and insulation costs.

Siding sales staff are typically good at selling. If they can add energy efficiency into their sales pitch, they can become an effective avenue for program promotion. Thus, while assessing your community's contractor base, take note of the siding contractors in your area and foster collaboration between the siding and insulation contractors.

Remodelers: Similarly, remodeling activities provide a wonderful opportunity to piggy-back efforts directly related to improving energy efficiency. In recognition, EPA will be piloting an adjunct effort to HPwES to target this market segment. Preliminary analysis indicates that suitably designed and constructed additions need not add to the energy consumption of the existing structure and when done via a whole-house approach, the final product can even result in less energy consumption than the original home prior to the addition.

Remodelers are an excellent contractor segment to train as HPwES contractors. Adding energy efficiency to their skill set is a perfect fit since they typically work in homes that can most benefit from home performance improvements.

Windows, etc.: Replacement windows are popularly thought of as important energy improvement measures, and they often are. The problem is that they typically are not cost-effective unless the incremental upgrade cost is thought of over a very long time horizon; e.g., 25 – 30 years. There are, however, important exceptions to this simplistic analysis. First, windows are often being replaced anyway, regardless of energy efficiency considerations, so the incremental cost of upgrading the replacement to a high performance window may be cost-effective. Second, if the windows are being replaced anyway, as with siding, it involves contractors in a position to help promote energy efficiency improvements in general. This means that window replacement contractors are in a position to be an important member of an efficiency program. And, like some other contractors, window sales staff are typically good at selling their product. If they can be brought into the energy retrofit program fold, trained and given the tools to sell a broader set of energy efficiency products beyond windows, they could become important program allies.

2.3.4 Key Indicators
Following are some key indicators to help you measure the contractor infrastructure, both in terms of its size as well as its training and sophistication with respect to whole building energy efficiency programs.

- **Number of blower doors/duct blasters shipped**: The two major manufacturers of this equipment are The Energy Conservatory in Minnesota and RetroTec in British Columbia, Canada. It may be possible to get shipment data to your area from them which, in turn, would provide a sense of local high performance capacity. High numbers of this specialized equipment in your jurisdiction suggest strong capacity; no such shipments suggest there's a significant amount of development work to be done.
- **Local BPI certified individuals**: Another key indicator is the extent to which there are individuals in the area who have received certification from the Building Performance Institute (BPI). However, BPI has a policy of not releasing the names of their certified individuals. Nevertheless, it is possible to get a feel for local BPI certified individuals at: http://bpi.org/tools_locator.aspx?associateTypeID=CTR. Indicate your local area and the table below the map provides a list of contractors and the specific certifications held by their employees.
- **Local BPI accredited contractors**: The same site mentioned above provides a list of the BPI accredited contractors in your area. As a reminder, there is an important distinction between BPI accreditation and certification. In addition to having at least one individual with BPI certification, BPI accredited companies have among their employees at least two different certifications. They also are committed to abiding by BPI standards and best practices in all that they do. This means all of their residential work receives comprehensive home assessments, and that they are seriously committed to high quality work, including attention paid to health and safety concerns of their customers.
- **Local RESNET certified auditors/raters**: Recall the conversation above regarding the differing standards ascribed to the term "auditor." RESNET trains auditors/raters to view a house and its systems in an integrated, whole-house fashion. A presence of local RESNET certified auditors/raters (see http://www.resnet.us/trade/find-raters-auditors) indicates that the auditor network will be well trained to perform comprehensive energy audits for your retrofit program.
- **Local RESNET EnergySmart contractors**: RESNET lists contractors and builders who have met certain standards, attended training events and passed an exam. A list of qualified contractors and builders can be found on the RESNET web site at: http://www.resnet.us/energysmart-contractor.

- **Local Weatherization Assistance Program activity:** If your area boasts a very active local weatherization program with a large number of trained and certified contractors, this presents an opportunity for leverage and coordination.
- **Yellow pages ads** for building performance contractors: The phonebook can be a surprisingly useful tool in identifying building performance contractors with an important caveat; it is not enough to simply claim to be high performance. There are a number of organizations that can help contractors market their services and which typically are identified in ads. The caveat is that it is possible to mis-use logos whether inadvertently or not. Both BPI and EPA, for example, have important rules dictating use of their brand and the numerous sub-distinctions each have; e.g., certification vs. accreditation vs. affiliation, ENERGY STAR products vs. programs vs. partners. And so on.   Due diligence is clearly important. More than one program has been negatively affected by unscrupulous contractors.

2.3.5 Geographic Coverage of Intended Program

Another perhaps obvious point, but one worth making, is the importance of identifying the intended geographic coverage. Something often forgotten is that different players and program components can have different geographies. For example, the local utility may cover an area different from the local political boundaries, which in turn can be different from the area intended to be served by your program. This is by no means fatal. However, it does mean that some serious thinking, planning and coordination are necessary.

3. PLAN

Planning is a key element in a successful program, but there are differing levels of plans and their ability to facilitate the introduction of a successful program or initiative.   First and foremost, the plan must communicate clearly what the program is intended to do.   This articulation of goals then should be a prominent component of all program literature, and all program components should be designed to facilitate meeting these goals. While obvious and easily said, it is quite another thing to implement. It is easy to lose sight of the forest by focusing only on some individual trees. Thus, this section will walk through the steps necessary to produce a clearly articulated plan around the goals of the program, utilizing the assessment of existing and needed resources outlined above.

Planning Steps

- Identify Program Goals
- Identify Program Barriers
- Develop Program Design

3.1 Identify Program Goals

Most programs have multiple goals and retrofit programs are no different. But in addition to identifying them, care needs to be taken to identify the extent to which these goals can clash. Some examples of potential goals follow:

3.1.1 Energy Savings

Foremost for energy efficiency programs, the goal should be to save energy. Without energy savings, there is not much point to the program, regardless of whether other goals are met. Take care to ensure that the program design focuses on this primary objective. Further, ensure that savings from the program are optimized.   Don't sacrifice an opportunity to achieve optimal savings for some other goal, however

noteworthy. It is far better to serve a few participants optimally, than to serve many participants sub-optimally.

3.1.2 Sustainability Post-ARRA
For those program supported by ARRA funds, another important goal is to ensure that the program design promotes continuation even after the stimulus money ends. Simply using stimulus funds to provide participation incentives, by themselves, does little to promote sustainability. The program also should promote development of a self-sustaining infrastructure that can endure, with or without supplemental funding from ARRA. This means development of mechanisms that will actually transform the market place; e.g., a critical mass of building high performance contractors who can continue to market themselves and their services independently of major program incentives.

3.1.3 Carbon Reduction
While carbon reduction tends to follow energy savings, not all Btus are created equal in this respect. A program focusing on electrical energy efficiency in a jurisdiction which largely uses hydro-electric or nuclear power won't result in significant carbon reduction, for example. Conversely, an area that primarily uses fuel-oil or other bulk fuels for residential heating could produce significant reductions in carbon emissions by targeting these end-uses.

3.1.4 Market Transformation
A corollary to the sustainability point is the need to actually transform the market, which means that the value to energy efficiency and its respective products and services become so well understood that no incentives to stimulate program participation are needed; the market is *thus* transformed. A main goal of energy efficiency programs should be to raise awareness, increase demand, and move the markets such that the program is no longer necessary. While this is typically the goal for residential retrofit programs, we are unaware of any retrofit programs that have actually achieved this worthwhile goal.

However, there are a number of signs that the insulation industry, for example, is beginning to transform in some markets by incorporating air sealing efforts in accordance with basic building science principles. Not only is their own industry being transformed, the companion air sealing industry is growing and working in concert with insulators. Thanks to efforts that encourage comprehensive home efficiency work, such as the federally sponsored HPwES program, these important signs suggest market transformation is occurring. Much more needs to be done, of course, before the residential retrofit arena is fully transformed. Therefore, your program is in a position to make an important contribution to the continuing transformation of the residential retrofit market.

3.1.5 Jobs
It is no secret that the desire to stimulate the economy by promoting job growth was a major factor in enacting the stimulus funding legislation to promote energy efficiency. However, training, equipping and deploying a residential retrofit work force will take some time. In our eagerness to get something "on the street," we should not forget to accommodate reality and allow for adequate ramp-up periods and the need for adapting to the needs of the local market. Consider, for example, what it takes to train new-hires adequately, as well as to stimulate customer demand for retrofits. However, energy efficiency work provides more economic stimulus and jobs than those directly created by the program. The work results in increased

spending on materials at local stores, hiring of local workers, and increased money in the pockets of those whose energy bills have been lowered through efficiency improvements may be spent at local businesses. Much research has been put into the "non-energy" benefits of energy efficiency work because of the local nature of the work and its impacts, and so residential energy efficiency programs are well positioned to play a positive role in job creation and local economic development.

3.2 Identify Program Barriers

The barriers to efficiency program success and participation, as well as the means with which to overcome them, are both obvious and subtle. They also can vary from jurisdiction to jurisdiction. The effort expended assessing your area and market will deepen your understanding of local barriers as you plan your residential retrofit program(s), but there are other considerations as well, including the following:

3.2.1 Demand
Lack of demand for energy efficiency work mainly comes from lack of awareness and lack of financial capacity. Below we discuss why these are barriers and how your program might be able to overcome them.

Consumer Demand: The biggest barriers to program success are lack of awareness of how the home functions and what the energy efficiency opportunities in a person's home are. In order to build effective mechanisms to raise awareness of both the opportunity and the benefits of efficiency investments, some significant thought and planning need to go into the message, to whom the message should be targeted, and the channels through which the message should be delivered.

Unfortunately, there is limited program experience with reliably motivating large numbers of Americans to invest in comprehensive home energy improvements – especially if they have to pay for the majority of the improvement costs. However, there are many lessons, shared below, from past experience and from social science research that offer new programs a strong foundation. Effective programs will tend to be tailored to the location, thoughtfully researched and piloted, personalized to the target audience, and thus are more labor-intensive than simple end-use incentive programs. Just as there is no single, monolithic customer, there is no silver bullet for driving demand for home energy improvements – but we know where to start. *(For much more on this subject, the seminal paper, "Driving Demand for Home Energy Improvements" can be found at:* http://eetd.lbl.gov/EA/emp/reports/lbnl-3960e-web.pdf*).*
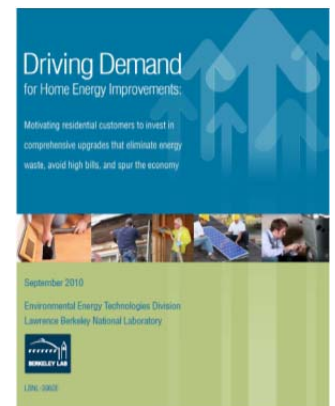
Marketing and Outreach Lessons:
- **It is not enough to provide information, programs must advertise *something people want*** – High home energy use is not currently a pressing issue for many people and it is helpful to find a more appealing draw such as health, comfort, energy security, or community engagement to attract interest.
- **Time spent *studying the target population* is important** – A blanket marketing campaign to reach "everyone" will likely be ineffective and expensive, especially at the start of a program. Find and target early adopters. Tailor messages to this audience. Demographics can help segment the market and select optimal strategies, but you can also segment the market by personal values, interest in hot issues such as health concerns, or likelihood of getting savings.

- **Partner with *trusted messengers*** – Larger subsidies and more voluminous mailings don't necessarily win over more customers. Programs can and should have a local face, with buy-in from community leaders. Tapping trusted parties, such as local leaders and local organizations, builds upon existing relationships and networks. Consider whether your local utility would be an asset or liability as a program messenger.
- ***Language* is powerful** – Avoid meaningless or negatively-associated words like "retrofit" and "audit." Use words and ways of communicating that tap into customers' existing mental frames, such as home improvement. (What homeowner do you know that is not interested in improving their home?) Encourage program staff and contractors to use specific, vivid examples and personalize the material wherever possible. Gaining public commitment from the homeowner can be crucial, such as saying, "Will you commit to lowering your energy use by 5%? I can help you do that. If you want to shoot for higher, I can help you do that, too."
- **Contractors are program *ambassadors*** – Contractors, more than any other party, are the people sitting across the kitchen counter making the final sales pitch to a homeowner – contractors are often the public face and primary sale force for the program. Most programs that succeed in performing a significant number of energy upgrades have worked closely with contractors. Conversely, poor first impressions or shoddy work by contractors can reflect poorly on the program. Be prepared to receive phone calls from customers about their contractors and have a mechanism for acting on the comments.
- ***One touch is not enough*** – The advertising industry's "three-times convincer" concept means that the majority of people need to be exposed to a product message *at least* three times before they buy into it. Energy efficiency is an especially tough product – it can't be readily touched, tasted, or seen – and that calls for a layered marketing and outreach approach that achieves multiple touches on potential participants. Partnering with other community conservation programs can be beneficial because the homeowner has taken one conservation action, and is likely to be ready to take another.
- **Word of mouth** – Finally, one of the best, most cost-effective ways to raise awareness is through word of mouth. This is impossible to do until you have some happy customers under your belt, but as you get off the ground with your program, or if you have a program already in place, seek out those customers who were pleased with the work done, ask for feedback and ask if they would be willing to provide a testimonial or if they would refer a friend to the program. Ask each person who signs up for your program, "Do you have any friends or family members who would also like to participate?" or "If I send you an email about the program, would you be willing to circulate it around your office?"

Making sure that customers recognize the value of the work done is both a public relations matter and a program design matter. Both happy and unhappy customers tell their friends, relatives, co-workers and neighbors. Unhappy ones poison the well. Happy ones do a lot of your marketing for you.

Uncertainty of Energy Efficiency Benefits: There are many who still think of energy efficiency in terms of freezing in the dark. Less well understood by the general public is that comprehensive energy efficiency efforts can result in clear and immediate reductions in monthly energy costs, as well as in noticeable improvements in comfort levels. Ill-conceived programs will not have these results and will further entrench myths.

There is also a great deal of misinformation that leads to distorted expectations of both the costs and benefits of efficiency work, as well as where to get the biggest bang for your buck. For example, claims that replacing windows will cut a home's energy usage in half lead many consumers to put these to the front of the list for efficiency investments. While energy efficient windows can be an important upgrade to improve a building's efficiency, they are rarely cost effective as measures like insulation and air sealing, which unfortunately are often the hardest to sell because customers can't see the product they've bought (unlike windows, heating systems, solar panels, etc.).

> **Design Programs to Succeed**
>
> To cite an extreme example to make the point that programs need to demonstrate immediate results to be effective: If a program only distributes two CFLs, the occupant is not likely to notice any change in the monthly bill. If a program comprehensively re-lamps all sockets, a change will be noticed. And, by the way, both can be cost-effective designs but only the latter is effective.

The Landlord-Tenant Conundrum: While tenants are typically the population that could most benefit from energy efficient housing in order to reduce their monthly expenses, they are not inclined to invest in their buildings to reduce energy consumption because they don't own them. On the other hand, the property owners of rental buildings typically don't pay the energy bills and so have little incentive to invest in making them more efficient. Thus, the conundrum. Getting landlords to improve the energy efficiency of their buildings offers a classic challenge and provides a significant barrier for programs to overcome.

Some of the solutions programs have implemented to overcome the landlord-tenant conundrum include offering incentives close to the cost of installing energy retrofit measures as an enticement to improve rented buildings. Another option implemented by communities including Burlington, Vermont and San Francisco, California include requiring certain minimum energy efficiency standards before rental buildings can be purchased by a subsequent buyer. Another technique is to trigger energy efficiency standards at the time of rental license renewal. These are policy options that can be considered, but probably will not directly be part of your program until after the policy is passed. Often times, cities and counties will pass a policy as such and have a program in place to assist with the market transformation and implementation of the policy.

Financial Resources/Restrictions: A major impediment to energy efficiency investments, especially comprehensive improvements that include both building shell and HVAC system improvements, is the lack of financial resources to afford them. Comprehensive efficiency upgrades can cost many thousands of dollars (many HPwES programs report an average job size of $5,000 - $10,000 per participant), and associated energy savings are unlikely to offset those costs entirely over the lifetime of the typical short term loans available to finance such work. Thus, it is important to design effective incentive structures for residential energy efficiency programs that provide a variety of options to help overcome this obstacle. The Clean Energy Finance Guide developed by the DOE's Technical Assistance Network's finance team should serve as a valuable resource to help you develop financing mechanisms to support your residential energy efficiency program(s). It is available at: http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/financingoverview.html.

3.2.3 Supply

Adequate and appropriate supply is the other half of the equation. No amount of consumer demand will help if the necessary supply is not there to meet it. Here we are speaking mainly of supply of adequately trained contractors and contractor support systems. Some think demand should be generated first so that supply is created in response. Others think it goes in the other direction. Ideal, of course, is for a program to grow both in lock step, as well as to have the ability to affect the extent of each in some way. It might be worthwhile to

set participation goals low for the first six months or year to allow the industry time to catch on. Flexibility and nimbleness are hallmarks of truly effective programs.

Technical Capability *of Installer Market*: Unlike consumer demand, which can occur almost instantly simply by making a splashy promotion, contractor supply capacity takes time to develop. Consider that even after developing contractor interest, many (if not most or perhaps even all in your jurisdiction) contractors then need to be trained (probably for at least a week) then mentored (at least for the first handful of jobs) then seasoned (perhaps for as long as a year), before they can help pull and push the program along. It is the rare instance (and there are some wonderfully notable ones) in which a contractor, contrary to self-promoting claims, has developed the necessary skills and experience for home performance work on his or her own. The program is generally required to build and maintain a competent contractor supply such as with a robust contractor training program and through collaboration with local trade associations.

Building Science Understanding of Contractors: Successful contractors must be able to understand building science in order to diagnose and successfully retrofit homes. There are a variety of diagnostic tools which the contractor must understand how to use. Hence the need for an extended training and mentoring period, and the value of basic certification as a first step in this process.   A recent article in Home Energy Magazine ("Pressure House Learning in Real Time", Jul/Aug 2010 issue, available at http://www.homeenergy.org), describes the New York State training center for its Low-Income Weatherization Assistance Program agencies and, in the process, nicely illustrates the subtleties and complexities of what must be learned and how it can be effectively taught.

A Sampling of Contractor Training Opportunities

Weatherization Assistance Program's Technical Assistance Center has a listing of training opportunities and DOE funded training centers:
- http://www.waptac.org/Training Resources/Training-Opportunities.aspx
- http://www.waptac.org/Training-Resources/WAP-Training-Centers.aspx
- Weatherization Assistance Program Standardized Curricula
  http://www.waptac.org/Training Tools/WAP Standardized Curricula.aspx

BPI Training and Continuing Education schedules:
- http://www.bpi.org/schedules.aspx

Check with local community colleges and trades associations for appropriate training opportunities in your area.

Contractor Sales Skills: As discussed above, some of the most cost effective elements of whole house energy efficiency are the hardest to sell because they can't be seen (air sealing and insulation). And unfortunately, there sometimes seems to be an inverse correlation between contractors' ability to be technically adept and the ability to sell the work necessary for high building performance. The two need not be mutually exclusive, of course, thus the importance of focusing specifically on helping contractors gain the sales skills and tools necessary to promote your program. As an example, one well established program actually requires a two to four week mentoring program on actual job sites, not only to teach contractor crews how to do a comprehensive energy audit and to conduct effective and efficient air and duct sealing, but also on how to sell the recommended comprehensive work scope.   Both the technical side and the sales side of the contractor training equation deserve equal attention. The one cannot survive without the other. Business management classes can also prove helpful since retrofit contractors

What is "Building Science"?

"Building Science" is used to describe the array of principles which, together, need to be understood in order for someone to walk into a house and successfully diagnose how it actually functions as a system and how it could be made to perform as it should.

are asked to ramp up rapidly and might not have the infrastructure, such as a Customer Relations Management system or a scheduling tool to handle a larger demand for their services.

Existing Training Infrastructure Availability: Happily, contractor training is a burgeoning arena. Some of the more traditional avenues for technical training are periodic events or conferences held locally. Affordable Comfort, Inc. holds conferences at both the national and regional level that are dedicated to getting contractors and program managers up to speed in the fast moving energy efficiency field. More information is available at: http://www.affordablecomfort.org/. BPI and RESNET also host local and regional trainings, and technical and community colleges have also begun offering courses in this area. Additionally, various states have established training centers and run courses periodically throughout the year. There also may be potential to partner with your state or local Weatherization Assistance Program (WAP) office, as they may have trainings available to their contractors and staff in which they'd be willing to let your program contractors participate. Many of these trainings also include the written portion of the BPI certification testing process as a part of their offerings. A few also can provide the field performance testing component as well. As noted above, it is also critical to include mentoring along with routine quality assurance processes to ensure superior program performance.

3.3 Develop Program Design

Programs need to be designed to enhance success and avoid failure. An example to illustrate: Some years ago, a utility program had an evaluation done of their first five years of delivery. The evaluation showed only a few energy units saved during that entire period. An investigator was hired to shadow the implementation contractor to try to determine what the contractor was doing wrong. It only took a day to conclude that the contractor was doing everything it could to make the program work. The problem was the design which focused on administrative ease for the utility and not on energy savings.

3.3.1 Seek Expert Advice

As illustrated above, good program design is vitally important but is also complex. Seek input from professionals skilled in the various components of your program; perhaps a lawyer, contractor, program manager, engineer and others whom you can call on for advice.

3.3.2 Enlist Local Stakeholders

Be Inclusive: Many groups in the local jurisdiction are in a position to help the program, whether in enlisting participants, providing verification of income for low-income program components, and affording the program with other means of support. Think of all who might be a resource to your program and invite them to participate and contribute their ideas. Examples of likely stakeholders are: local utilities, state/local energy offices, housing organizations, contractors or representative groups, groups representing specific target populations (e.g. seniors, low income, housing associations).

Seek Buy In: As you develop your program plans and are preparing to launch, make sure you've brought along your stakeholders as committed participants and champions of your program. This will help build the community's trust in the product and enhance your marketing efforts from the get-go.

3.3.3 Identify and Secure Resources

In order for your residential efficiency program to be successful and sustainable, you will need to secure resources beyond any initial seed funding. However, not all of these resources need to be monetary to have value to your program.

Short-Term and Longer-*Term Program Funding*: Any ARRA resources should be considered short-term funding to help get your program off the ground. Other short and longer term funding opportunities should be explored and, if possible, secured. One of the more common funding opportunities may be through local utility companies which may be required to establish energy efficiency targets and ways to achieve them. There may be other funding opportunities specific to your area and the type of program you are considering, and assistance developing ideas for sustainable funding mechanisms can be sought through DOE's Technical Assistance Network (TAN).

Financing Products: As previously discussed, there is an array of short and longer term financing products that can extend and enhance your program's resources. There is a TAN team dedicated to providing guidance on how to identify and/or develop these resources. See the DOE TAN Finance Team's Clean Energy Finance Guide at: http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/financingoverview.html to learn more about how to develop the financing component of your program(s).

Personnel, Administrative, and Other Resources: You may be able to borrow or leverage existing personnel, administrative and other resources (such as on training and quality assurance) from other existing programs. If your program is government funded, perhaps your local government can provide marketing assistance or legal support.

3.3.4 Plan Program Infrastructure

Programs require administration, management, implementation, IT support and so on. How to do all this can take many different forms and depends as much on the existing infrastructure and capacity as on theoretical desires.

Options for Program Administration Models: There are many program models that can be adopted for your retrofit program, but you may have to tweak a model for your local needs. Here are some examples, all or components of which may lead to the best model for your community.

All In-House: Given adequate resources and resolve, it is possible to fulfill all of the necessary programmatic functions under one management structure, with direct "in-house" employees. This model can provide a high degree of control and may enable changes to be made quickly if the organizational structure isn't too cumbersome. The challenge of this model is the need for a lot of resources and a long-term commitment to the program beyond the timeline of stimulus funding.

One slight twist to this model is to split basic functions between partner organizations; e.g., one is the "face" of the program but some "back-office" functions are actually handled by others such as database management, implementation of the retrofit, quality assurance, or the energy savings analysis. Another option is to have the administrator role played by an outside entity. This entity may be subcontracted, a consortium of related organizations (such as a group of utility company representatives), or a Board. The benefit of an outside administrator is third party oversight, while the downside can be increased limitations on program flexibility.

> **Our Definitions of Administration, Management and Implementation**
>
> **Administration:** Also called the Program Administrator, provides oversight to ensure that the goals of the program are met under the rules specified.
>
> **Management:** Day-to-day oversight of program operations, including development of program policies, standards, and resources (marketing, training, QA) that help meet the goals of the program.
>
> **Implementation:** Application intake, scheduling, auditing, and installation of efficiency measures.
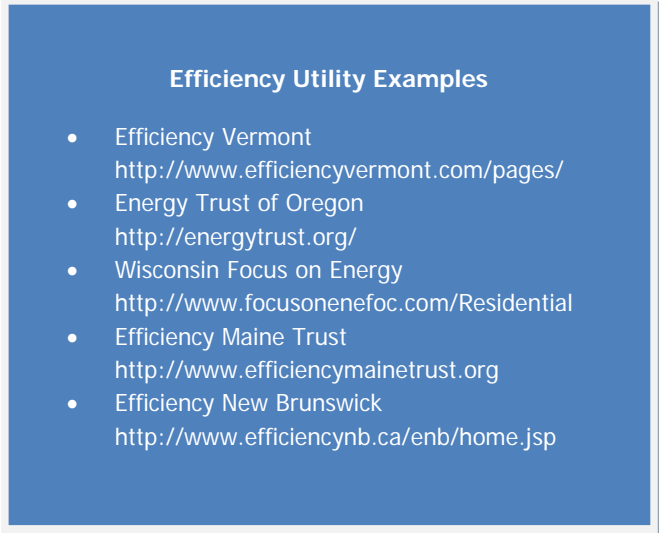
In-House Administration and Management Overseeing Implementation Delivery Contractor: In this model, the program sponsor (likely a municipal or state office, in the case of ARRA funded programs) retains all administrative and managerial control, but engages an implementation contractor to provide all direct services such as measure installation, oversight of crews, scheduling, and basic database management.

An important distinguishing factor of this model is that it relies upon the contractor market's resources to implement the efficiency work. Iterations of this model could include 1) one large contractor overseeing and performing all work (similar to many weatherization agencies), 2) a large group of contractors participating in program service delivery or 3) some combination of these arrangements. The success of this approach

depends upon the current status of your community's contractor base – whether there is an adequate contractor base and the level of training needed to have them perform at the level you desire. This approach relies upon the market's resources, so the amount of investment in direct program hires would be lower under this model.

Efficiency Utility Model: A slight twist on both models is to form what is known as an efficiency utility. Like other utilities, it reports to the local public utilities commission and serves all rate payers. Instead of providing energy directly, however, it does so indirectly in the form of energy savings ("negawatts"). The first such efficiency utility, Efficiency Vermont, provides some interesting background for this model at http://www.efficiencyvermont.com/pages/Common/AboutUs/.

Efficiency Utility Examples

- Efficiency Vermont
  http://www.efficiencyvermont.com/pages/
- Energy Trust of Oregon
  http://energytrust.org/
- Wisconsin Focus on Energy
  http://www.focusonenefoc.com/Residential
- Efficiency Maine Trust
  http://www.efficiencymainetrust.org
- Efficiency New Brunswick
  http://www.efficiencynb.ca/enb/home.jsp

It is worth noting that prior to the formation of Efficiency Vermont, Vermont had over 20 electric utilities (many of them very small) which were each required by statute to provide energy efficiency services to all of their customers. One result was a hodge-podge of programs and some real inefficiencies in delivering these programs. With the advent of Efficiency Vermont, all rate payers in the state, regardless of utility, were eligible to participate in the same programs with the same range of benefits. Additionally, the move established efficiency as carrying equal weight and being worthy of equal investment as energy generation, which was an important policy shift that set the stage for other states to follow the example.

3.3.5 Determine the Implications of In-House or Out-Sourced Services
There are technical, financial and political implications to whatever model is chosen. While they cannot all be accurately forecast, they nevertheless should be investigated. Further, care should be taken to understand why it is that one or another should hold sway.

3.3.6 Plan Service Delivery Infrastructure
In addition to having a clear sense of how the overall program infrastructure should work, there also needs to be considerable attention paid to how the service delivery component is to work. The choices essentially are three:

1) use direct employees;
2) use sub-contractors; or
3) use a combination of the two.

Regardless of which is adopted, there will be a number of important issues to be addressed, such as hiring (including development of job descriptions), the timing of hiring, and development of a training/certification and quality assurance process (both of which are discussed in greater detail below).

3.3.7 Plan for a Quality Assurance Process

High quality program delivery requires a strong quality assurance/quality control (QA/QC) component. This means more than having customer satisfaction surveys conducted or making the occasional site visit outside of the measure installation process. Remember, it is possible to have high customer satisfaction but minimal program savings, and making site visits, by themselves, cannot ensure high quality.

Moreover, in order to judge the quality of the work done, the program must also develop the standards by which quality will be measured. Not only does it help promote quality, but can enhance your relationship to the people actually doing the work. In order to do that, work standards must be well communicated and clearly understood. A best practice would be to reference the standards in a contractor participation agreement, which all participating contractors must agree to and sign prior to participation in the program. The DOE Technical Assistance Network (TAN) has developed a webinar discussing how to develop a strong QA/QC component for residential retrofits program that can serve as a valuable resource.

> **Quality Assurance Resources**
>
> For more detail on realistic QA goals, key elements and additional resources, see the DOE TAN QA webinar at:
>
> http://www1.eere.energy.gov/wip/solutioncenter/pdfs/Quality_Assurance_for_Residential_Retrofit_Programs_Slides.pdf

3.3.8 Plan and Develop Certification and Accreditation Requirements

Related to quality assurance is identifying the training standards contractors (or employees) installing efficiency measures must meet. Is it enough that they meet basic licensing and insurance requirements, as well as good standing with the Better Business Bureau? Does being a direct program employee already meet the requirements afforded by credentialing that otherwise would be required of outside contractors? Will you reference an outside set of requirements, such as BPI certification or the Workforce Guidelines currently being developed by DOE, or develop your own program-specific requirements? It is perhaps in this program component that the various program and DOE goals come to a head. Clearly, without good installers, savings goals cannot be met. But creating jobs suggests the need for a non-exclusive set of participation criteria. Either way, establishment of a certification/accreditation standard or other third party credentialing is considered a best practice, as it provides an important bit of evidence as to basic technical understanding and competence.

Another important aspect of credentialing is the extent to which it should be required. The BPI distinction between certification (individuals) and accreditation (companies) provides a nice example of the issue. Under the BPI procedures, a contractor could be accredited (and, hence have at least one certified individual), but there is no assurance that the field staff either have or are continually supervised by someone who is certified, whether or not with a relevant certification. However, BPI accredited companies do also commit to working to BPI standards, and evidence of a company not meeting those standards has resulted in suspension from BPI. The decision you ultimately make on whether and what level of credentialing to require will affect many other aspects of program planning and design, such as training and quality assurance.

3.3.9 Develop Training/Monitoring Plan

Whether in-house or sub-contracted site crews are used, there is a need to ensure they are adequately trained and receiving appropriate follow-up monitoring. This requires clear and detailed plans for both; particularly with respect to any certification and accreditation requirements. Additionally, have regular training for program orientation, changes in the program or policies, and other relative community issues that staff should

understand as they approach people about energy efficiency. Examples of issues that warrant training include when a new climate action plan is adopted in the city, when lighting standards change, or when a new program is offered by the utility. It is very important to recognize that training does not happen once, but is an on-going, annual process for new and seasoned employees/contractors alike. It is for this reason that well established programs such as WAP allocate 10% of their total budgets annually to training and technical assistance.

The TAN's QA webinar referenced above also discusses some excellent models for monitoring field work, as these monitoring activities can serve as opportunities for real-time training. For instance, a monitoring plan that includes some portion of in-process job monitoring allows issues to be resolved while the crew is on-site, while providing training to ensure mistakes aren't repeated at other homes.

3.3.10 Procure Program Staffing Resources

Once you have identified your resources (both financial and other), and decided upon a program management and delivery model, you will need to get started bringing those resources online in order to be ready to serve customers once the program launches.

3.3.11 Develop RFP, Hire Contractor(s)

Depending on what (if any) resources you will be procuring from outside sources, you will need to develop one or more Request for Proposals (RFPs), review proposals, select contractors, negotiate contracts, and hire the winning team. This is certainly not a minor set of tasks. It is essential not only to recognize the importance of these tasks, but plan for the amount of time each takes to complete.

> **Technical Assistance Resources**
>
> Under the ARRA SEP and EECBG Technical Assistance Program, state, local, and tribal officials can access a network of experts for assistance with their renewable energy and energy efficiency policies and programs.
>
> Types of technical assistance available:
> - Technical
> - Financial
> - Building Efficiency through Performance Contracting
> - Program Design and Implementation
>
> DOE can also provide grantees with case-specific assistance in other areas, if the request is in line with the intent of the TA grant guidelines. These projects are available on a first come, first served basis, and fulfilled by a team of DOE and contractor resources as an integrated provider network.
>
> Find out more at http://www1.eere.energy.gov/wip/solutioncenter/technical_assistance.html

For instance, making sure that your RFP is well written and clearly articulates the job(s) you expect bidders to perform will save a significant amount of time and energy in later stages of reviewing proposals, selecting winners, and negotiating contracts. It also may help you secure a better price, as respondents to RFPs that contain too much ambiguity may raise their prices in order to accommodate for the concern that they don't clearly understand the expectations.

RFP examples and sample scopes of work that have been used around the country for various energy efficiency and renewable energy products and services are being collected and hosted by NASEO. Information on these resources is online at: http://www.naseo.org/arra/rfp/.

Additionally, you should recognize and build into your plan that getting through the entire process, from writing the RFP to signing the contract with the winning bidder will take at least several months, and possibly more depending on your local regulations. If you are releasing these from within a local or state government entity, consult your local procurement office to find out the average turn-around time on RFPs and the

contracting process. You should also consider utilizing any RFP templates they may have available, and be aware of any standard language that you will be required to incorporate in your formal procurement documents.

3.3.12 Develop Job Descriptions and Hire

Just as with RFPs, be sure to allocate the necessary time and resources to this important task. If you are hiring within a municipal or state entity with a highly structured job classification system, job descriptions for auditors, installers of home energy upgrades, and inspectors of this work may not exist. Take care that you do not adapt existing job descriptions and classifications which may seem related, but in fact may be very different from the skill set you are seeking. For instance, some municipalities have been known to classify home energy upgrade technicians at the same level as maintenance or custodial staff. Depending upon the training and certification requirements you will be expecting of the position, this type of classification and pay scale may not attract the level of talent you will need to effectively carry out the work.

3.3.13 Develop Auditing and Reporting Tools

Whether field work is subcontracted or completed by in-house staff, activities carried out will need to be reported. Reporting should help address two necessary tasks. First, it allows the program to claim/report savings generated, and second, it can provide an important management tool. Reporting requirements should be consistent and provide adequate information to accomplish both reporting and management tasks, but not overly rigorous or confusing so as to discourage program participation or produce bad information. It is not unheard of for contractors to use program leads to sell their services without use of program incentives since that is easier than adhering to program reporting rules if they find them particularly onerous.

> **Building Energy Software**
>
> A list of building energy software packages, some of which are available for free for a small fee, can be found on the DOE website:
>
> http://apps1.eere.energy.gov/buildings/tools_directory/subjects.cfm/pagename=subjects/pagename_menu=other_applications/pagename_submenu=utility_evaluation

There are several software packages available that run DOE approved auditing software along with a back-end that supports job data entry and management reports. Such products could be essentially bought "off the shelf" and then customized to your individual needs.

Another option is to have separate auditing and reporting tools. A benefit of this might be that contractors could utilize whatever auditing software they have been using and won't need to invest in a new auditing tool. On the other hand, it would mean that contractors would have to enter information twice for a specific job, since they would have to report the job and work performed in a separate reporting system, unless you are able to link the two through and IT process, which will take time and budget.

3.3.14 Contractor Sales Tools for Customers

In addition to auditing and reporting tools, contractors should be provided with sales tools to enhance their capacity to sell program services. Several programs explicitly incorporate sales training and special customer sales reports stemming from the audit process to ensure optimal uptake of program offerings. Customers are the ultimate arbiters of what measures are installed and they should be provided the means by which good decisions are made. Savings projections are but one aspect of this process. Improved comfort and

health/safety, convenience, building durability, contributions to reduced carbon emissions, ease of the general transaction process, and so on are also important factors in the customer decision process.

3.3.15 Provide Access to/Incentives for Building Diagnostics Equipment

The majority of retrofit contractors do not have the specialized diagnostic equipment necessary for comprehensive energy audits and quality retrofit installations. Successful programs provide some sort of provision for assisting contractors in acquiring the needed equipment. This may be done through the following means:

- *Financing*: The most common form of assistance provided to contractors in acquiring equipment is financing, but this can take many forms. Among them is having the program purchase the equipment and then leasing it to contractors with payment assigned per completed job through a fee added to the job cost. After a certain number of successful jobs, the equipment is then sold to the contractor for an agreed upon amount. Another form is a simple lease/purchase agreement that is not tied to production. Another might be a cash incentive towards the contractor's purchase of necessary equipment, possibly tied to a number of successful program completions. There are likely other variations as well.

- *Bulk Purchasing*: Another form of equipment financing that can be offered is for the program to negotiate discounts from suppliers for bulk purchases and then to pass on the savings to contractors.

3.3.16 Develop Marketing Plan, Materials and Infrastructure

How a program is marketed can have important repercussions to its success. Beyond trumpeting the program's virtues to customers (and contractors), a number of other factors also should be considered in the marketing campaign. Both over-subscription and under-subscription are not good. As noted earlier, deep knowledge and understanding of the overall market is critical to crafting an appropriate marketing plan.

Targeting to Highest Savings Opportunities: An often neglected aspect to program marketing is the inescapable fact that not all houses afford the same opportunity for deep savings. Some homes are already very energy efficient. Others are in need of major structural repairs which may preclude much in the way of program investments. Still others are occupied by those who are unlikely to participate for various reasons, such as income or ownership status (i.e., renters). For all this, *there* are many who would be pleased to participate, who have major savings opportunities, and when properly approached, can provide major energy savings in a more cost effective manner.

Programs often confuse the need to provide universal access with the need to do a large marketing campaign and thus, undervalue the process known as target marketing. Effective targeting will not only provide the greatest energy savings for the program, but can also be a good way of developing a network of happy customers right at the beginning because of the impacts of the work done on their homes (reduced energy bills, increased comfort, health and safety concerns addressed, etc.). Satisfied customers will spread the word to their friends and neighbors, and may be even willing to provide a written or video testimonial that the program could use in subsequent marketing materials. Personal stories that illustrate program success may be one of the most effective ways of marketing your residential energy efficiency program.

Ability to Quickly React to Market Conditions: A corollary to effective targeting is having the flexibility and nimbleness to adjust to circumstances. Initial program efforts may include, for example, lucrative incentives for customers and contractors alike to participate. But the success of such efforts may soon outstrip the ability of program budgets to be sustained. Similarly, a thoughtful and well-crafted campaign still may not produce desired participation and savings rates. Both situations can happen and do. And in both cases, your ability to quickly adjust the program design can reap large rewards. In the case of programs overseen by regulatory agencies, it is critical that the initial filing provide the necessary flexibility so that both course corrections and the information to communicate program changes to the market may be made quickly rather than having to undergo lengthy negotiations and review processes.

Contractor Sales Materials, Approaches and Training: As noted above, the basic program training and qualifications for contractors participating in the program should include sales and marketing training and support. Additionally, those trainings and support materials should be continually reviewed to ensure the greatest program success.

Taking into account the attractiveness to consumers of measures like heating system upgrades and solar panels, the program needs to consider how to prioritize the less obvious but most cost-effective measures, air sealing and insulation. There is an important connection between the technical competency to evaluate and recommend home energy upgrades that address comprehensiveness, and the sales skills to effectively inform (sell) the customer of the relative importance of each upgrade. Comprehensive home energy upgrades are the goal, but if the customer cannot afford to do everything at once, the contractor should know how to help that customer address upgrades in phases that still achieve the best end result, which is maximized energy savings.

3.3.17 Develop Quality Assurance/Quality Control Processes

The importance of a strong Quality Assurance/Quality Control (QA/QC) component to your program cannot be understated. It links to nearly all aspects of your program:

- **Work Quality Standards** must be identified in order to have an effective QA/QC component; otherwise, how can contractors and your QA/QC personnel identify areas of non-compliance, or where training might be necessary, or where a health and safety issue was left unaddressed? Not only must the work quality standards of the program be identified, but a best practice would include inclusion of a contractor agreement that acknowledges the work quality standards as a basis for program participation.
- **Training** will need to be developed which addresses the work quality standards adopted by the program, and provides a mechanism for continual improvement as issues are identified through QA/QC.
- **Marketing and Customer Satisfaction** will be enhanced as the program can better educate customers about the value of the program. Additionally, QA/QC provides the assurance that there are processes in place to ensure that contractors will in fact deliver that value.
- **Energy Savings** ties directly to the quality of the work done; and therefore, it is not enough to say what measures are covered under the program, but also how well they are installed and whether they are installed in a manner that achieves the greatest energy savings possible.

Below, we discuss various components necessary for a strong QA/QC component to your program. An additional resource is the Quality Assurance for Residential Retrofits Programs webinar developed and

presented by the TAN. Both the presentation and the audio component are accessible at http://www1.eere.energy.gov/wip/solutioncenter/.

Contractor Oversight: A major component to any QA/QC process is continuous oversight of contractor activities. This should not be an arbitrary numerical minimum number of sites visited, nor should it be a process of warnings with no repercussions. All contractors should be provided the necessary opportunities to understand why an action was not appropriate, how to avoid mistakes in the future, and to correct past mistakes as appropriate. Thus, clearly identifying and training on the program's work quality standards as a condition of program participation is essential. Clearly identified standards will help not only enhance the program's impact, but can improve the program's relationship to its contractor base. Contractors will not operate cooperatively in an environment where the work quality they are being judged on isn't clearly identified and communicated to them in advance.

But should contractors, who have been afforded these opportunities, continue to transgress, there should also be clear procedures for them to be summarily dismissed, and even punished if appropriate. Programs that do not have strong and well documented contractor remediation procedures may find that they spend an inordinate amount of program resources dealing with a handful of contractors unwilling or unable to meet the standards of the program, and those resources are taken away from achieving more energy savings and serving more households in your community.

Similarly, some programs promote all-inclusiveness for contractor participation, and given that local job growth in the energy efficiency sector is an important goal of the EECBG grants, keeping programs as open to contractor participation as possible is understandable. However, under this model you will need to realize and plan for the increased amount of program resources that must be expended on quality control efforts. If this is a new program or a pilot, you should focus on growing contractor participation at the outset and adjust criteria as contractors are added and as conditions warrant to ensure program success.

Customer Feed-Back Mechanisms: Consumer surveys can be an important tool when properly crafted and conducted. What counts is not so much "are you satisfied?" as acquiring clues and insights into whether things are working as intended or not, and if not, why not. "Did you like/dislike X?" is not as important as understanding why the like or dislike exists. Questions and formats should be crafted with great care. Remember: not everything countable counts, and not everything that counts is countable.

Continuous Improvement Systems: Training and QA/QC should be considered on-going. While the program is operating, there will never be a time when contractors, no matter how seasoned, will not need to add new skills or hone existing ones. Thus, you should consider adding mechanisms which identify and promote areas for continuous improvement into your QA/QC design. A way to do this can be by performing inspections at various stages of the job. For example:

- A number of inspections could occur after the audit, but before any work gets done, in order to assess how well the auditor identified the needed energy upgrades. Or you could have an inspector watch the auditor while he/she performs the audit.
- Inspections could occur as the crew is working on installing the home energy upgrades. This provides excellent information to identify optimal (or less than optimal) work practices and to correct them and train the crew in real time.
- Traditionally, inspections occur after all of the work has been completed, and these are important as well.

These inspections can be excellent opportunities to provide on-site mentoring, identify areas where additional training is necessary, and enhance two-way learning. Programs should not be static. A program that has not changed in years is probably not nearly as successful as some might think.

3.3.18 Develop Call Center

A component of many successful programs is a call center. Call centers can serve as the "face" of the program to the customer, and thus should be capable of providing superior customer service and strong support of program goals. This includes the ability to track critical metrics, providing timely follow-up and assisting contractors in maintaining schedules. When planning for a call center, you should consider:

Coordinating with Other Local Programs: If you have identified related energy programs in your area, check to see if they have a call center already established, or if you might work together to establish one. Call center staff should be well versed in all of the other programs and services that can help support your program efforts, and provide referrals and related assistance as appropriate. Call centers that do this well make it easy for customers to work with programs, and happy customers make for better program enrollment.

Train Call Center Staff: Often overlooked is the need to train call center staff as comprehensively as contractors. Call center staff should, at the very least, be trained in what happens on-site during a home energy retrofit in order to be able to effectively communicate to customers what to expect. Some programs strive to train their call center staff to the same certifications as the contractors in the program. Nothing can undermine a program as quickly and effectively as call center staff who consistently provide customers with the wrong or misleading information.

3.3.19 Develop Incentive Structures

The point of program incentives is to encourage the right behavior, to discourage wrong behavior, and not to reward those who would have done the desired thing anyway ("free-riders"). This clearly is as much, if not more, an art than a science, but there is a great deal of experience upon which to draw in designing your program's incentive structures. The TAN has developed webinars and white papers on this topic which go deeper into this subject area, but some things to consider are:

> **Incentive Structure Resources**
>
> Webinar: Designing Effective Incentives to Drive Residential Retrofit Program Participation:
>
> http://www1.eere.energy.gov/wip/solutioncenter/webcasts/default.html

Encourage Comprehensive Retrofit, and Discourage "Tire Kickers" and "Cherry Pickers": Simple prescriptive incentives, while easily administered, tend to reward activities which often would have occurred regardless and to ignore the desired goal of deep retrofit and maximal savings. A tiered incentive structure, or one that includes a "bonus" for comprehensiveness, can help move consumers and contractors alike towards the desired program goals.

Inclusion of All Participant Classes: As noted earlier, targeting high savings opportunities is important for program success. It does not follow, however, that there should only be limited program access. Of particular concern is to ensure access to all income segments and not just those who happen to be best able to afford investments in energy efficiency. The best programs are those which have a single retrofit program design

with various entry points and tiers and many tools to help households of varying financial means be able to participate.

Low-income participants that meet the income criteria of the federal WAP should be directed to that program's resources (or to appropriate internal resources if you have decided to partner with the WAP and provide additional resources). However, there are many households whose income is above the guideline for the WAP, but still do not have access to the resources to pay for home energy upgrades. In this case, an educational program component on no cost actions, such as saving $200 per year by using a clothes rack rather than a dryer, is appropriate for the clientele who cannot afford to make home improvements. Furthermore, a sliding scale incentive structure and/or reduced rate financing may provide the necessary access to the customer class with a low budget. As noted above, he TAN's Clean Energy Finance Guide provides a wealth of information on different financing products that will be useful to you as you develop your incentive structure.

Consider Assignment of All Customer Incentives to Contractors: One practice gaining currency, so to speak, is to allow customers to assign the incentive to the contractor. The advantages are that the total cost of the retrofit is "instantly" discounted, the remaining cost may not need financing, any financing that is needed is for a lesser amount, and the contractor is assured of a direct payment from the program. The reduced "hassle-factor" is not to be discounted either since the customer does not have to wait for the program incentive in the form of a separate check (which can also add to some degree of customer confusion). And this approach puts the decision in the hands of the customer – they can decide whether they'd prefer to receive a check from the program or have the contractor immediately discount it from their bill. An additional benefit is that the program has greater leverage for receiving the required data from the contractor if she/he is being paid directly for it.

3.3.20 Develop IT (M&V) System

By now you can see that it is clear there are a lot of moving parts to track in order to effectively manage a residential retrofit program. M&V refers to "Measurement& Verification", and is the system by which you can watch and evaluate the many metrics of program success in order to identify strengths and weaknesses, and make changes accordingly in a timely fashion. Therefore, a robust data management system is needed that includes:

An Integrated System: The IT system for participant tracking needs to be fully integrated from first call to final inspection to results reporting.   The program should be able to track where a program participant is at any stage of the process in order to provide good customer service and identify areas where the program may not be performing adequately. For example, the system may track the length of time it takes for a customer to get to different stages of the program, and where improvements could be made.

Automatic Reports: Data required by various funding sources and for internal planning will need to be tracked. A good IT system should be able to produce reports that aggregate the necessary data in

Examples of Common Data Points to Collect for a Residential Retrofit Program

- Type of housing structure
- Square footage
- Number of Building Occupants
- Pre and Post Work Blower Door Readings
- Pre and Post Conditions of Home
- Measures Completed
- Materials Installed
- Dates Work Completed
- On-Site Labor Hours
- Labor & Material Costs

And many more, depending on your program's goals and local needs.

order to streamline the reporting process. Management reports should also be developed for internal planning and quality control. Such a system can inform program management about:

- How a customer heard about the program, which can help inform marketing strategies
- How quickly the program responded to the customer, which can identify resource needs/constraints
- What measures the customer chose to have done, for two reasons: 1) this helps gauge whether the program is meeting energy savings targets, and 2) this can help the program target follow-up with those that didn't choose comprehensive improvements to see if work could be done to remove barriers, enhance customer education, identify a contractor training opportunity etc.
- Track success at meeting program goals/targets, and inform when goals/targets were unrealistic and need to be changed
- Track the energy usage data before and after participation in the program, though this might pose issues with data privacy restrictions on behalf of the utility company and you may need to have the customer sign a utility waiver and set up a data collection system with your utility

There are likely other functions a good IT/M&V system can serve for your program, and so it should be structured by looking at your goals, identifying what information you need to collect, both to report and to assess your success at meeting those goals, and building reports that aggregate the data in such a way as to be meaningful tools for program management.

4. IMPLEMENT

Having gone through the processes to assess and plan your program that were outlined in the previous sections, you are now in great shape to successfully launch your program. When you get to this stage and as you launch your residential retrofit program, there are several things that you should keep in mind:

4.1 Be Fully Ready for Business before Opening the Doors

This should be obvious but is often not heeded. The problem in that there are numerous pressures, political and otherwise, to begin program operations as quickly as possible. The result is the strong temptation to fly the plane before it is completely built. For example, some programs have been known to launch their marketing campaign before the infrastructure has been completely set up. This is understandable as you want to build the demand in order to justify the supply. But take caution, because it will be even more damaging to your program to confuse the market before your contractors are ready to start work. It is best to have everything in place, and then have your advance marketing campaign announce a certain launch date.

4.2 Consider a Focused Pilot with Clear Boundaries

In a brand new market, a pilot program provides an opportunity to try out ideas and technologies before becoming committed to anything, to learn while doing, and to develop strong working relationships with a few committed contractors before opening the doors to others. In addition to providing a laboratory for testing ideas and processes, a pilot will allow time to develop a full-grown program ready to operate from the first day by providing a built-in "ramp-up" period.

As recognized earlier, there often is a strong desire to push a program's capabilities before they are ready, and this can be damaging to the long term success of a residential retrofit program. Rather, being thoughtful in staging the roll-out of these efforts may be the best solution.

4.3 Focus on Reducing Hassles

This is a key consideration for both the customers as well as the contractors participating in the program. It can be difficult to determine what the most important pieces of information to collect in a new program are, thus a pilot also provides the ideal test-bed for identifying and removing or minimizing all of the hidden "hassle-factors" that increase administrative burdens and minimize participation and savings. You will learn how to streamline your application process, data gathering and management strategies through what you find most useful in the pilot, as well as what might be missing.

4.4 Focus on the Highest Savings Opportunities

While this has been covered in earlier sections, it should continue to be a focus as you implement your program. Targeting those customers with the highest savings opportunities will produce high energy savings yields as well as a batch of customers who may be willing to contribute testimonials or success stories to the next wave of program marketing and outreach.

4.5 Support the M&V System through IT Services

Like all aspects of program management, the IT system should support continuous improvement, as well as be continuously improved itself. As discussed above, you may discover different pieces of data you wish to collect, or different ways to aggregate and report the data, which will help to optimize program operations. On-going support and development of your IT/M&V systems will also enhance your program's ability to be responsive to changing market conditions.

4.6 Identify and Carry Out Research and Development Projects

Energy efficiency technologies and the ways in which to optimize efficiency in a residence are always changing. In order to address new technologies, processes and opportunities, mature programs should consider incorporating an R&D component. An R&D effort will continue to look at the horizon, and test and integrate new technologies and approaches that will keep your program viable.

4.7 Offer Continuous Contractor Training and Support

On-going training and contractor support activities should be an integral component of your program design. There are many resources available to help you achieve this:

- The WAP network has developed several excellent training centers around the country, many of which have opened their doors to training contractors outside of the traditional low income program.
- Community and technical colleges are also quickly adding building science and installation courses to their curriculum to support this growing market segment.
- If your program has identified a certification standard (BPI, RESNET or other), the certifying entity may also provide access to training resources to your contractor base.
- As mentioned above, the QA/QC process should incorporate training and mentoring as a central component.
- And ensure that existing contractors are supported as leaders. The best programs learn how to support the really good contractors, the "bell cows", who can be in the best position to help encourage the others, and integrate them in their QA/QC strategies. We are all competitive creatures and in need of good models to follow.

5. EVALUATE

Programs should be continuously evaluated in a variety of ways, as described above (management reports, QA/QC, customer feedback mechanisms, etc.) Additionally, programs should conduct formal process and impact evaluations by third party professional evaluators. If you have leveraged money for your program from other funding sources, it is possible that such evaluations are either required or desired, and thus it may be possible for you to acquire additional resources to conduct them.

A *process* evaluation looks at field and/or operations processes and identifies ways to work more effectively to achieve the program goals. Process evaluations should be part of the management strategy, but also can be performed on a formal basis by a third party. An *impact* evaluation looks at pre and post energy consumption to see if projected energy savings met realized energy savings, and may propose reasons for any variation, as well as ways to optimize energy savings. Process and impact evaluations should identify areas of improvement and areas of strength, and can also lend a level of legitimacy to claims made by the program, energy savings or otherwise.

The following steps should be considered as you develop your third party evaluation plan:

5.1 Determine who is Responsible for Evaluation

In addition to an explicit line item in the program budget, evaluation needs should be supported administratively. As suggested above, this should include an independent third party or program administrator.

5.2 Develop an Evaluation Schedule

The necessary data tracking processes should be identified and implemented at the outset. Impact evaluations should be conducted every few years, recognizing that you will need to build up a number of jobs to evaluate as well as enough time to acquire pre and post work energy consumption data for the evaluation to be worthwhile and informative. Process evaluations can be both formal and informal (usually performed by program staff). Sometimes formal process evaluations can be incorporated with impact evaluations, but the informal variety could be as frequent as quarterly.

5.3 Develop Savings Verification Process

In order to know how your program is doing in relation to its goals you will need to develop a savings verification process, including the necessary savings algorithms. This needs to be an integral part of everything related to service delivery and data management. How do we know that projected savings are reasonable? Waiting for the results of an impact evaluation means answers are a couple of years after the fact. Ideally, the impact evaluation confirms the initial projections.

5.4 Develop and Implement an RFP to Select Evaluation Contractor(s)

Ideally, though not critical, the RFP for selecting an evaluation contractor would be issued and the evaluator selected before full-bore program implementation so that the evaluator can help to inform the necessary elements of data collection. Otherwise, the program should look to acquire the services of a program evaluator within one to three years of program launch, keeping in mind that the program will need to have enough completed work to be able to have the results be statistically significant.

5.5 Ensure Feed-Back Loops through Annual Program Design Process

At the very least, there should be an annual program design review to ensure that, in addition to the day-to-day adjustments made, there is an opportunity to make other longer term changes to the program design and operations. Evaluations should be utilized as part of the program's continuous improvement strategy, and evaluation findings can lead the program to ask new questions, consider new ways to operate, and lead program planners back through the circular "assess, plan, implement, evaluate" process introduced at the beginning of this playbook.

Attachment A: Frequently Used Abbreviations & Terms

ARRA: American Recovery and Reinvestment Act of 2009

BPI: Building Performance Institute

Building Science: The array of principles that, taken together, need to be understood in order for someone to successfully diagnose how a house actually functions as a system and how its performance could be improved.

Cost Effectiveness: The economic analysis that compares the relative cost of an energy improvement and its energy cost savings to the present conditions under which no energy improvements are made.

DOE: U.S. Department of Energy

EE: energy efficiency

EECBG: Energy Efficiency and Conservation Block Grant

Energy Improvement Measure: An energy saving approach

EPA: U.S. Environmental Protection Agency

HPwES: Home Performance with ENERGY STAR

HVAC: Heating, Ventilation and Air Conditioning

IT: Information Technology

RE: Renewable Energy

RESNET: Residential Energy Services Network

RFP: Request for proposal

SEP: State Energy Program

Solution Center: http://www1.eere.energy.gov/wip/solutioncenter/

TAN: Technical Assistance Network

TAP: Technical Assistance Project

WAP: Weatherization Assistance Program