

# An Analysis of Utility-Sponsored Home Performance with ENERGY STAR® Programs in Maryland

*For the Development of Recommendations for Benefit-Cost Improvements and Enhanced Adoption*

Prepared for:

The Maryland Energy Administration

Prepared by:



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## Executive Summary

The Maryland Energy Administration (MEA) seeks to better understand the factors impacting the cost-effectiveness of utility-sponsored Home Performance with ENERGY STAR® (HPwES) programs as reported in the Maryland Public Service Commission (PSC)-funded evaluation report produced by Itron in 2013. In particular, the MEA is interested in recommendations for program enhancements for submission to the Maryland PSC for adoption by Maryland utilities.

SRA International, Inc. (SRA) was contracted by MEA to evaluate the utility HPwES programs and the process by which they were evaluated. SRA was asked to provide characteristics representative of successful programs that might be adopted by Maryland Sponsors. Finally, MEA desired input from a variety of stakeholders to add further perspective to the analysis.

Information from the Maryland PSC records, Itron and other program evaluators, and the *Mid-Atlantic Technical Reference Manual Version 2.0* (TRM) was reviewed to understand the calculations used in order to derive the benefit-cost values cited in the Itron report. Input from stakeholders was gathered in order to understand the respective opinions regarding what aspects of the programs are functioning well and aspects that could be improved. Stakeholders included utility Sponsors, implementation contractors, participating contractors, a contractor trade association, and one of the authors of the Itron evaluation report. Additionally, a literature review was conducted in order to categorize industry best practices and potential applicability to Maryland. Government, NGO, and private-sector sources were reviewed as part of this study and some industry-recognized successful programs were listed as those of potential interest to Maryland. Finally, national HPwES Sponsor data from the 2012 calendar year was evaluated in order to identify potential elements of successful programs and provide a qualitative perspective of how Maryland Sponsors perform on the basis of Sponsor-reported per-project energy savings and project cost.

The recommendations presented address two main areas—program design and implementation and cost-effectiveness. Some key design and implementation recommendations include:

- Unify program characteristics such as tactical elements, messaging, and incentives.
- Involve all program stakeholders in oversight and tactical advisory work groups.
- Tweak the QHEC program to improve penetration of the program and to use it as a gateway to the HVAC and HPwES programs.
- Provide clear, homeowner-centric pathways into the programs with little burden during retrofit delivery.
- Adopt a mix of simplified prescriptive and comprehensive performance-based incentives.
- Incorporate natural gas savings into statewide HPwES programming.

SRA was unable to provide definitive cost-effectiveness conclusions due to information that was unattainable during the time parameters of the study such as the rationale for the discount rate used for the Itron evaluation and the most current version of the Technical Reference Manual released. The recommendations for cost-effectiveness are based primarily upon industry best-practice as represented by recent standard activity and the professional experience of SRA staff

with exposure to the program design and implementation for multiple programs outside of Maryland.

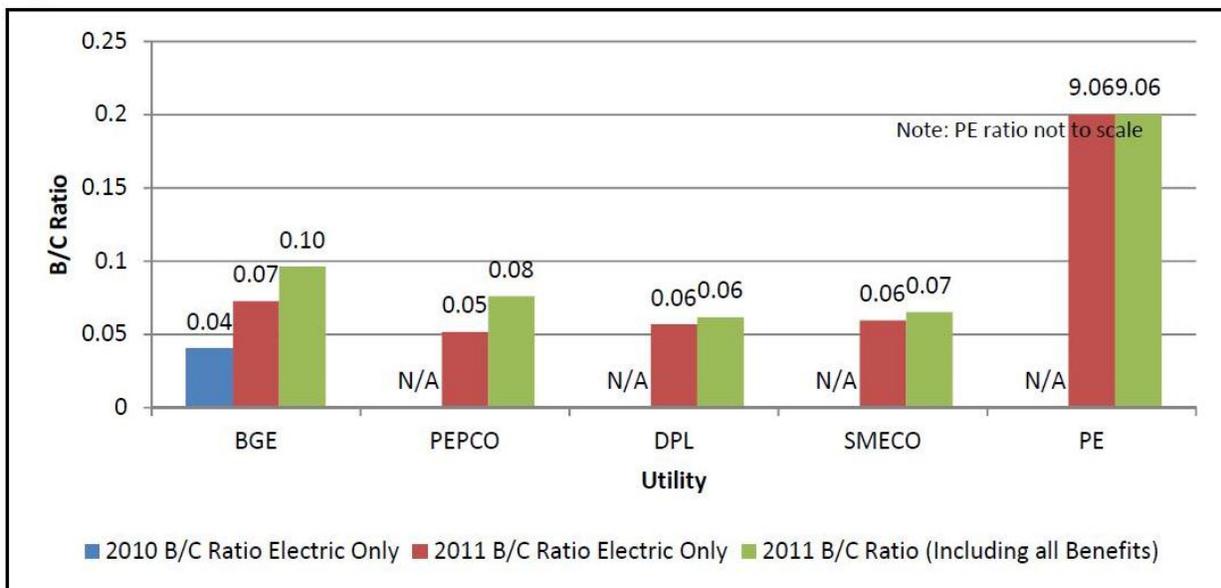
Representative recommendations include:

- Ensure net-to-gross ratios are equitable to account for upselling from simpler programs and market transformation effects.
- Consider accounting for the higher cost of renewable energy during benefit-cost analysis.
- Reconsider assumptions such as discount rate and useful life factors during benefit-cost calculations.
- Consider alternative screening methods (energy modeling with SIR threshold) in lieu of those stipulated in TRM.
- Pursue research into project energy savings and program cost variations among Maryland Sponsors.

## Introduction

The EmPOWER Maryland Energy Efficiency Act of 2008 (Maryland General Assembly, 2008) stipulates that the state must support energy efficiency programs toward goals of reducing electric energy consumption statewide by 15% by 2015 and electric demand reduction of 15% by 2015. In response to this act, the Maryland Public Service Commission (PSC) has approved five Home Performance with ENERGY STAR® (HPwES) programs submitted by electric utilities serving the state’s homes and businesses as part of the suite of residential EmPOWER programs. In the summer of 2009, Baltimore Gas and Electric (BGE) launched Maryland’s first HPwES program. The other independently owned utilities (IOUs) have followed BGE’s lead and now they all have a HPwES program within their residential portfolios overseen by the PSC.

In 2012, the PSC commissioned a program evaluation report (Itron, 2013) published in 2013 that indicated poor cost-effectiveness performance of HPwES programs suggesting a benefit to cost ratio of approximately one-tenth of the amount spent on the program based on results reported through calendar year 2011. The evaluator’s results as determined through the Total Resource Cost (TRC) formula for each of the five participating IOU’s are shown in Figure 1.



**Figure 1.** Utility Benefit/Cost Ratio for HPwES Program (Source: Itron (Itron, 2013))

As a key stakeholder in the design and execution of the EmPOWER programs, the Maryland Energy Administration (MEA) requested a review of these cost-effectiveness determinations and recommendations for potential improvements to program design that may promote more positive benefit-cost ratios and broader adoption of the program by Maryland residents. SRA International, Inc. (SRA) was contracted to perform this study. This paper examines the process that contributes to program cost effectiveness including measures installed, associated benefits and costs, and calculations used. Additionally, successful programs in other states were examined to determine potential strategies for Maryland to adopt. A series of recommendations are presented for MEA to consider as modifications are developed for current and future program implementation.

## Approach

The purpose of this report is to identify actionable recommendations for enhancing Maryland's EmPOWER residential programs. In particular, the focus of this effort is to better understand the underlying reasons for the poor cost-effectiveness results for HPwES included in Itron's 2012 program evaluation report (Itron, 2013) taking a two-pronged approach:

1. Determine if modifications to the evaluation approach, cost-effectiveness inputs and/or calculations should be considered to ensure these programs are being evaluated effectively and fairly.
2. Identify program design and implementation strategies to improve the overall delivery efficiency of the residential programs, decrease administrative burden, and to reach more homes with deeper energy savings.

SRA utilized several resources to develop the recommendations presented in this paper including a review of existing literature on the subject, informal interviews and meetings with key stakeholders, and the collective experience of the SRA team as consultant to the U.S. Department of Energy (DOE) for the National HPwES Program, as well as direct experience working with Maryland and several other states in various capacities to support residential energy efficiency programs throughout the Mid-Atlantic and Northeast regions.

To understand the cost-effectiveness approach used in the preliminary evaluation of the EmPOWER programs we reviewed several sources including: the Itron 2013 EmPOWER evaluation report previously mentioned, the *Mid-Atlantic Technical Reference Manual Version 2.0* (NEEP, 2011), Public Service Commission of Maryland records associated with EmPOWER (Energy Efficiency, Conservation and Demand Response Programs Pursuant to the EmPOWER Maryland Energy Efficiency Act of 2008, 2008) including related orders, the *EmPOWER Maryland 2013 Annual Report* (MD PSC, 2013), and related stakeholder comments including conclusions reached by Vermont Energy Investment Corporation (VEIC) in their comments to the PSC on behalf of the State of Maryland's Office of People's Counsel (VEIC, 2013). Additionally, personal interviews were conducted with representatives from key stakeholder groups including sponsoring utilities and the contractors for implementation and delivery of services within their programs. Given the short period of time available for conducting these interviews, it was possible to schedule and complete only a small sample of informal interviews. Results of these discussions should be considered in the anecdotal context in which they were obtained.

Best practice for comprehensive home performance energy efficiency programming was evaluated using a combination of literature review, observations from local and national meetings related to the on-going development of the home performance industry, and a review of data from the latest national Home Performance with ENERGY STAR annual report submissions to DOE by HPwES Sponsors. Reports published by the American Council for an Energy Efficient Economy (ACEEE), Consortium for Energy Efficiency (CEE), the Home Performance Resource Center (HPRC), and the National Home Performance Council (NHPC)

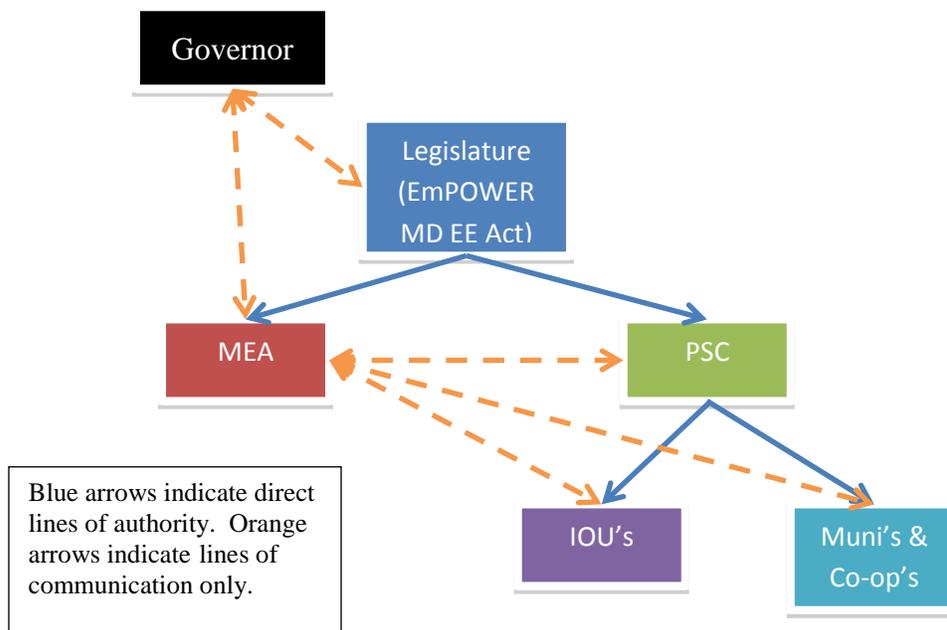
were also reviewed to identify potential recommendations applicable to the Maryland utility-based programs.

In addition, related resources available through other DOE projects were investigated for applicability such as a review of relevant guidance for energy efficiency program evaluations resulting from DOE's recently published Uniform Methods Project (UMP) report (Jayaweera, 2013).

## Findings

### Maryland's Legislative and Regulatory Energy Efficiency Policy Landscape

As an initial step in understanding the cost-effectiveness for the utility-run HPwES programs, SRA reviewed the organizational structure that influences the review, and ultimate approval, of the utility submissions to the PSC. Orders, utility filings, and stakeholder comments related to PSC Case Nos. 9153-9157 (the cases for each IOU resulting from the EmPOWER MD Act) were reviewed via the PSC's website. The EmPOWER Maryland Energy Efficiency Act of 2008 (EMEEA) is the overarching statute driving all energy efficiency programs in the state. Stated goals are to achieve 15% energy consumption reduction and 15% peak demand reduction by 2015 on a per capita basis using 2007 electricity data as the baseline. EMEEA instructs the PSC to authorize, oversee, and report on energy efficiency program activities and progress toward state goals. EMEEA instructs the PSC and MEA to communicate and that the PSC should take MEA's recommendations into consideration. The act also requires the utilities to consult with MEA regarding the adequacy of their plans. MEA however has no direct authority over the actions taken by either the PSC or the utility sponsors (see Figure 2).



**Figure 2.** Organizational Structure of Utility HPwES Programming

The construct of this organizational chart does not authorize MEA's direct control over any of the participating entities. However, it positions MEA as a neutral arbiter who can serve as a valuable resource both for guiding program design and offering uniform program messaging for the public statewide.

The IOU's as well as the municipal and cooperative utilities are required to submit their energy efficiency plans to the PSC and report on their contributions toward statewide energy efficiency goals. The Governor's Office then publishes the aggregated results for the state on its public website so Maryland residents can monitor progress toward EMEEA's goals. EMEEA enables the PSC to authorize utility energy efficiency plans that the commission "deems appropriate and cost effective to encourage and promote the efficient use and conservation of energy." EMEEA provides no guidance to the PSC as to how cost-effectiveness should be determined.

Initial HPwES program designs were received favorably by the PSC with noted enthusiasm for the potential to leverage Quick Home Energy Checkup (QHEC) audits and HPwES in a coordinated effort to provide the appropriate level of service to all Maryland homeowners.

The PSC has noted skepticism regarding the applicability of the tests stipulated in the California Standard Practice Manual (CSPM) (CA PUC, 2001) which are commonly used in program evaluations, favoring instead an approach that focuses on "ensuring a real return on the ratepayer's investment (MD PSC, 2011)." Since the inception of the EmPOWER programs, the PSC has steadfastly maintained an arm's length approach to oversight of cost-effectiveness for these programs believing the legislature's omission of a clear definition of cost-effectiveness to be pertinent and meaningful. If Maryland is going to achieve its energy efficiency goals, creativity and flexibility in program design and implementation is required. The cost-effectiveness tests described in the CSPM tend to have the adverse effect, supporting more conservative program approaches at the risk of leaving otherwise achievable energy savings unrealized.

In the same 2011 order, the PSC established that cost-effectiveness should be evaluated at the sub-portfolio level (i.e., collectively for residential programs and collectively for commercial and industrial programs,) acknowledging that it may not always be possible to maintain positive benefit-cost ratios for each individual program within a portfolio when aggressive energy savings targets are being pursued. Lastly, the PSC indicated that utilities should use gross energy savings when reporting values claimed toward statewide energy reduction goals, and net energy savings for cost-effectiveness purposes to capture free ridership and spillover effects.

The impact of the PSC's position on cost-effectiveness has been the establishment of a relatively unrestrictive regulatory environment for the development and implementation of energy efficiency programs in the state. This is good news for programs like HPwES, which offer significant market transformation benefits in addition to the more traditional resource acquisition focus of most demand side management programs. While many other states struggle to justify performance based market transformation programs under increasingly restrictive regulatory orders, Maryland's PSC has adopted a far more progressive position creating a highly favorable environment for programs like HPwES to develop and thrive.

A second legislative act that impacts utilities and, potentially, their energy efficiency programs is the Renewable Portfolio Standard (RPS) (Maryland General Assembly, 2012) which has a goal of 20% production of all electricity generated within Maryland from renewable sources by the year 2022. This legislation, while strictly addressing renewable fuel sources and percentage mandates for electricity generation; influences energy efficiency efforts by effectively

incentivizing reduction of both electric consumption and demand in order to reduce the necessary purchase of more costly energy from renewable sources. Additionally, the RPS mandate has potential implications for cost-effectiveness calculations if HPwES and other residential programs can be shown to contribute to off-setting the cost of acquisition of renewable energy-derived electricity to meet the 20% goal.

## Review of EmPOWER MD Residential Energy Efficiency Programs

With the PSC’s December 2011 Order (MD PSC, 2011), the Maryland utilities were instructed to: (1) “standardize their programs to a greater extent”; and (2) “form work groups to develop additional programs designed to reach [the EmPOWER Act’s 2015] goals.” In accordance with this, in their 2012 program filings, the Maryland utilities embarked on offering more consistent programs across their residential EmPOWER portfolios. Table 1 is a summary of the residential retrofit programs, as well as the HVAC offering, for each of the Maryland IOU’s.

Utility	Branding	HVAC			QHEC	HPwES
		Equip. Rebate	Tune Up	Duct Sealing		
<b>BGE</b>	BGE Smart Energy Savers	X	X	X	Free, walk-through audit with recommendations and direct install of efficiency measures; cross marketing of HPwES, whole house program	Subsidized \$100 comprehensive audit, recommendations, and application for HPwES rebates
<b>Delmarva Power</b>	Delmarva’s Energy Savings Programs	X	X	X		
<b>Pepco</b>	Pepco’s Energy Savings Programs	X	X	X		
<b>Potomac Edison</b>	Potomac Edison, Your First source for Energy Savings	X	X	X		
<b>SMECO</b>	Save Energy, Save Money	X	X	X		

**Table 1.** Maryland Utilities’ Home Energy Retrofit Pathways

While the programs are more alike than different, the utilities each have individual branding for their portfolio of residential programs. Additionally, there remain some differences in the administrative implementation of these programs, particularly with regard to:

- Energy modeling software
- Customer tracking and reporting tools
- Utility procedures, protocols, and certification requirements for participating contractors.

Since 2011, participation levels have been on the rise for all three of these EmPOWER programs, however, each have noted challenges meeting targets (VEIC, 2013) as noted below:

- QHEC: difficulty increasing penetration in the single-family market
- HPwES: savings per project is declining

- HVAC: missed production targets

To gain an understanding of the inter-dependencies of the residential retrofit and HVAC programs, we outlined the options and steps from a homeowner's perspective. As indicated in the Figure 3, there are multiple possible entry points as well as potential "end points," indicated in red, where the homeowner either drops out or discontinues participation in the programs. A continued effort to streamline and coordinate the delivery of these programs starting with assistance selecting the most effective path (QHEC, HVAC, or HPwES) to meet the customer's needs could help to minimize these potential attrition points.

The chart illustrates that there are opportunities to make sure customers do not feel overwhelmed and get on the right track somewhere around "Possible Actions" and "Choose an EmPOWER program."

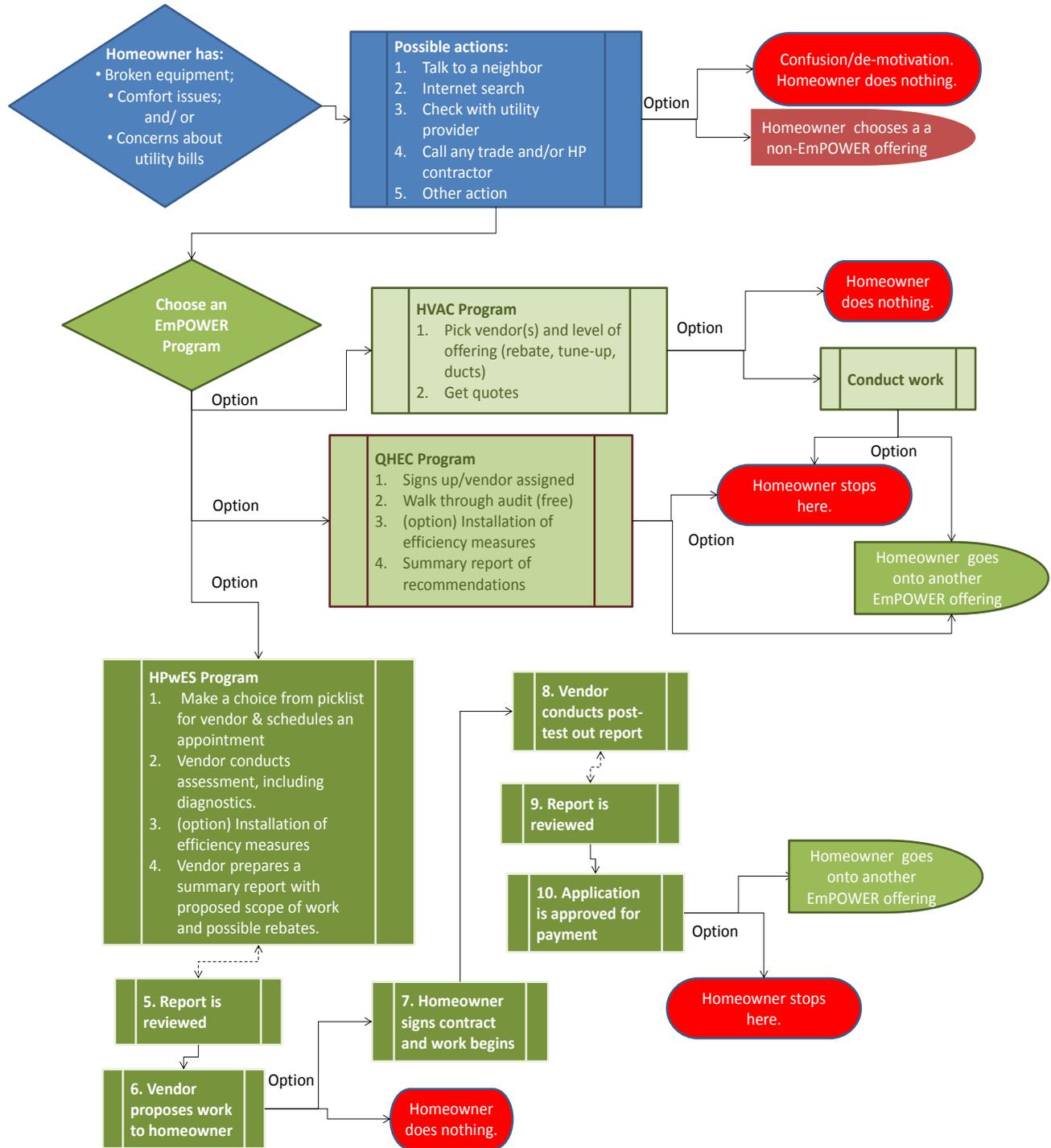
### ***Quick Home Energy Checkup (QHEC)***

The QHEC program may be worthy of increased attention as both contractors and sponsor representatives have made mention of it. The process for qualifying QHEC contractors is similar for four of the utilities in that a request for proposal is advertised and contractors respond with qualifications and geographic preferences. A BPI Building Analyst certification is required for staff performing QHEC audits. Potomac Edison permits any contractor possessing the BPI Building Analyst qualification and distributes leads equally among all the participating contractors. Home performance contractors participating in the QHEC program report using this program to qualify and train new or inexperienced employees. They indicate that little profit is generated from this program, but it is considered to be the price of admission into this environment. Furthermore, they report great difficulty in getting more comprehensive energy efficiency work from the homes where they conduct QHEC audits. While not formally prohibited by the utilities, the rules established prohibit doing more comprehensive work at the time of the QHEC audit and only permit contractors to refer the homeowner to the HPwES program. This rule set effectively quashes the single most powerful leveraging point in the customer transaction by disabling the QHEC contractor from converting a project to HPwES during the QHEC appointment. As a result, added costs are incurred by the customer, the contractors, and the program to schedule and complete a second independent site visit. Additionally, the contractors confirmed that the majority of QHEC audits are performed on multifamily structures. One contractor advocated opening up the QHEC program to all contractors possessing the appropriate certification and then equally distributing the referrals to this group. He felt that this would have a large impact upon program scale and overhead experienced by trade contractors.

### ***HVAC Program***

A suggested program improvement is an increased focus on bringing the HVAC contractors into HPwES. As indicated by Figure 3, the customer's process for participation is complicated with multiple pathways for homeowners and potential exit points prior to project completion. HVAC contractors desiring to just "swap boxes" don't have to contend with the added costs of program participation. This makes it difficult for home performance contractors to compete with HVAC contractors. Additional measures such as duct sealing and shell improvements only add to the

HVAC job costs thereby reducing contractor motivation to upgrade the project. There is a clear need for better integration of the HVAC offer with HPwES.



**Figure 3.** Customer Decision Tree for Potential HPwES Projects under Utilities

### **HPwES**

Also of note in Figure 3, the HPwES program appears complicated and overwhelming, making it difficult for a customer to understand the value of paying extra for this service. As a homeowner, the other two programs appear to be easier, faster options to address concerns. Additionally, there currently exists significant separation between the contractor pools engaged in each of these programs resulting in a “silo effect” in the actual delivery of these programs. Instead of taking advantage of customer contact and on-site observations to assist homeowners in pursuing all available program resources, contractors are more likely to be encouraged to quickly move customers through the program they represent alone.

Within the HPwES Program, the process of pre-approving every project (step 5) is an unnecessary step in a mature program with experienced contractors. Programs in other states are learning that removing (NJ) or reducing (NY) the frequency of this step helps expedite project cycle times and reduces some of both the contractors’ and program’s administrative burden.

Some possible improvements are:

- Offer a centralized clearinghouse or other obvious initial point of contact that could be marketed statewide to manage customer inquiries.
- Position QHEC as the gateway to the other programs, while still allowing for other points of entry; QHEC could cover the basics (e.g., installation of direct install measures and education on whole-house opportunities) for homeowners, while funneling customers needing additional work to the appropriate path – HVAC only or HPwES.
- Encourage cross-program referrals.
- Within HPwES, reduce delays and possible attrition by offering pre-approvals or “auto-proceed” options for certain types of projects and/or contractors with good track records.
- Leverage HPwES as a customer’s “one-stop shopping” solution. Most HPwES programs have already integrated direct install elements so a customer going directly to HPwES can still receive the free instant savings measures they would get from QHEC, but they also receive a customized blueprint for making energy improvements and access to a contractor/consultant who will see them through the improvement process.

## Home Performance Industry Best Practices and Perspectives

### *Literature Review*

ACEEE recognizes exemplary energy efficiency programs on a national level annually (ACEEE, 2013). In 2013, two programs, one operating as a HPwES program (Massachusetts) and another similar to the HPwES concept (Arizona). These states received exemplary recognition for their whole house retrofit programs, Arizona's Efficient Home Program and Massachusetts' MassSave Home Energy Services—both ratepayer-funded and utility administered programs

The Efficient Home Program is based in Arizona and is targeted toward HVAC services. Previous versions of the program experienced resistance to a separate comprehensive audit followed by the installation of HVAC improvements. Customers balked at the numerous visits required prior to project completion and HVAC contractors capable of providing comprehensive audits were limited. The program transitioned by authorizing all participating contractors to sell qualifying measures. The program stipulates that every participating home, with a few exceptions receive whole house blower door testing and/or duct leakage testing. Additionally, by changing from prescriptive-based to performance-based incentives eligible measure uptake increased 294% and program delivery costs decreased 12% from 2011 to 2012. From a measure basis, the largest upward trends included air sealing (at 1107%), duct testing and repair (at 991%) and early retirement of HVAC systems (at 446%). Key lessons learned reported by the program include the importance of inviting top contractors in on the design process and giving their recommendations serious consideration, and keeping the focus on measure proliferation with no compromise in quality. Cost-effectiveness is said to follow by applying these guidelines.

The Mass Save Home Energy Services Program provides comprehensive home audits, energy efficiency incentives, and financing options to drive program demand and promote improvement projects. The home energy assessments are free of charge and include direct install measures such as compact fluorescent lights, water aerators, low-flow showerheads, and programmable thermostats. Both electric and gas utilities jointly offer this fuel blind program which is administered by seven independent utilities under a single statewide umbrella managed by the state's Energy Efficiency Advisory Council. Lessons learned reported by the program include the importance of fuel neutrality in order to provide incentives that minimize customer and contractor confusion, broad-based and consistent statewide standards and marketing of the program, establishment of a Residential Management Committee which is representative of all of the program administrators and specialized working groups with all stakeholders represented in those topic-specific groups, and providing multiple paths into the program.

In 2010, the Home Performance Resource Center published a set of recommended best practices (HPRC, 2010) for residential energy efficiency retrofit programs based on nine case studies<sup>1</sup> of local programs. While this paper was published at a time when national legislation (the proposed Home Star Energy Retrofit Act of 2010) proposed to provide funding for residential energy efficiency was on the agenda in Congress and was later voted down in the U.S. House of Representatives, many of the strategies and recommended approaches still remain useful and applicable to an evolving home performance market. These recommendations include:

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<sup>1</sup> These case studies can be found on HPRC's website: <http://www.hprcenter.org/best-practices>

- Provide “simple, consumer-friendly” processes with “clearly defined requirements and minimal paperwork”.
- Provide and/or enable access to sources of consumer funding/financing.
- Promote consumer awareness of home performance and all of its benefits.
- Collaborate with the private sector (e.g. home performance contractors) to leverage market resources and develop industry capacity to deliver home performance services.
- Provide a business-friendly regulatory environment by maintaining stable program funding and rules, as well as allowing for a variety of contracting business models to exist in the market.
- Utilize mid-stream incentives to defray the cost of participation for contractors.
- Support workforce development initiatives including access to training and certification providers.
- Provide quality assurance oversight for the program.

In another recently published document, the National Home Performance Council (NHPC) outlined a roadmap (NHPC, 2013) for a successful home performance industry titled, “Bringing on the Boom and Beating the Bust.” This document suggests several best practices for successful energy efficiency programs. Several recommendations worthy of note include:

- Predict and measure savings more accurately.
- Provide mechanisms for making non-energy benefits resulting from the upgrade more visible,
- Reduce costs to the homeowner, changing cost-effectiveness tests to implement best practices (described in other NHPC reports discussed below).
- Encourage the abandonment of tests if adherence to best practices cannot be achieved.
- Decouple utility profits from energy sales, providing utilities with incentives for creating energy efficiency.
- Facilitate simple data collection and transfer protocols.

A summary of actionable steps, per this literature review, is presented in the Conclusions and Recommendations section.

### ***Stakeholder Feedback***

To better understand all perspectives of participants in the utility programs, a sample of interviews were conducted with local contractors (and contractor groups), utilities and their implementing contractors, and the Evaluation, Measurement, and Verification contractor (Itron).

### ***Contractors***

#### ***Efficiency First***

At the local level, Maryland’s Efficiency First Chapter (EF MD) has taken an active role in providing a platform for the voice of the contractor to be heard. They are in close and constant communication with the MEA program manager supporting HPwES. The EF MD Chapter also

consistently provides testimony before the PSC regarding utility filings and commission orders, and provides suggestions for improving the home performance market. A proposal being vetted within the Chapter before official submission for MEA's consideration specifically addresses the cost-effectiveness considerations addressed in the Itron report. Key topics within this proposal include addressing the QHEC, proposing a basic or prescriptive energy upgrade path, proposing an advanced energy upgrade path, championing a home energy labeling program, and evaluating a rebate methodology proposed with an advanced energy upgrade path.

In the proposal, the QHEC is proposed primarily for low income and moderate income homes. QHEC would add gas and water saving measures in addition to plug load and home automation energy saving measures (to be researched and further clarified).

The proposed basic or prescriptive energy upgrade path is geared toward moderate-income customers and proposed to include measures whose energy savings are accounted for in a deemed fashion rather than by using modeling software. This path also proposes to enhance the HVAC program by incorporating the EPA's Quality Installation program<sup>2</sup> based on the Air Conditioning Contractors of America's (ACCA) HVAC Quality Installation Specification (ACCA, 2010). Other trades are also suggested for this path including those representing windows, doors, roofing, and siding. Under EF MD's proposal, rebates for those measures with low deemed energy savings would be minimal.

The proposed advanced energy upgrade path includes whole house energy modeling and projects would be required to incorporate at least two measures. Rebates would be based upon a percentage of the estimated present value of the lifetime energy savings. No maximum cap is proposed as the measures selected would be cost-effective by definition in EF MD's proposal, and the rebates offered would represent only the percentage of the savings realized by the utility. The author of the proposal believes that this approach will foster attempts to reach deeper savings.

Finally, the proposal advocates making low-cost financing available for installed qualified measures and promotes the use of home energy labeling programs, such as DOE's Home Energy Score program.

#### *Participating Contractors*

Two contractors active in the Maryland programs were interviewed and they both indicated a value to them from the utility-sponsored HPwES program.

One contractor indicated the usefulness of leveraging incentives to upsell more comprehensive home retrofits (both energy and non-energy related). In particular, for customers interested in alternative energy, reducing electric loads by installing efficiency measures prior to specifying alternative energy systems keeps the cost of the project down and helps sell these projects. This contractor strongly urged the inclusion of measures that target consumer behavior such as power meters. He believes the installation of this one measure alone may lead to retrofit jobs in the future (both new and continuing.) An additional suggestion was to incentivize customer referrals

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<sup>2</sup> Additional information on this program is available on EPA's website:  
[http://www.energystar.gov/ia/home\\_improvement/downloads/ESQI\\_factsheet.pdf](http://www.energystar.gov/ia/home_improvement/downloads/ESQI_factsheet.pdf)

based on the assumption that word of mouth referrals provide better marketing results than traditional media routes currently employed. This contractor noted that attic insulation, air sealing, and rim joist insulation are the most common measures installed under the HPwES program.

As for barriers, it was reported that QHEC auditors are prohibited from promoting their own company to convert customers to HPwES creating an artificial disconnect for both the customer and the contractor. Too many discrete touches by too many individual companies create a convoluted experience for the customer and excessive overhead burden on the participating contractors as illustrated by Figure 3. In this case, it seems that the implementation-contractor's guidelines regarding the process for referring a candidate home from QHEC to the HPwES program inhibit the conversion rate. This is compounded by the contractor's tendency to use the QHEC program for training or employee vetting. These inexperienced technicians may not possess the technical skills or marketing and sales acumen to properly identify and effectively promote comprehensive retrofits.

Another contractor indicated a belief that the company would not be in existence without HPwES. This company performs auditing and quality oversight for installed measures. The only barrier mentioned was the cost of overhead to the subcontractors used for measure installation due to program requirements such as certification and training. Competing home improvement firms offer the same services but are not burdened with the overhead that those participating within utility programs face. Attic insulation and air sealing are the most common measures sold to homeowners by this company.

On a national level, the Home Performance Market Forum, an industry initiated event held in Las Vegas in March 2013, identified a number of program, policy, and industry improvements necessary for home performance to thrive (Beley). Key among these is the necessity to involve all stakeholders in the development of efficiency programs including manufacturers, distributors, trade organizations, and contractors. Participants also concluded that home assessments must be simplified. Key action steps identified during the forum include:

- Development of systems and tools that utilize actual energy consumption data to quantify measured results of HP projects
- Peer and non-peer mentoring, similar to the ACCA Mix Group® Program<sup>3</sup>
- The development of an industry coalition to influence energy policy
- Expanding funding sources beyond those offered by utilities
- The simplification or elimination of building energy modeling
- The development of case studies chronicling success stories and failures

A summary of actionable steps, per these ideas raised by industry, is presented in the Conclusions and Recommendations section.

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<sup>3</sup> Additional information found at ACCA site <https://www.acca.org/members/mix-groups>

### ***Utility Sponsors and Implementation Vendors***

Two utilities were contacted for this project. One referred the researchers to their implementation vendor while the other responded personally. This utility reports that only 20% of the homes visited for QHEC are identified as candidates for HPwES. Conversion rates from HPwES audits to projects with installed measures range from 28-34% for those utilities which track that information. These figures were also noted in OPC's comments to the PSC (VEIC, 2013). This utility representative further confirmed contractor reports that the most common measures installed in HPwES are attic insulation, air sealing, and rim joist insulation and expressed concern that benefits that are integral to HPwES like comfort and health and safety are not currently being valued in cost-effectiveness calculations.

Both the utilities and the contractors have indicated a desire for zero or low cost financing to promote deeper retrofits.

All of the IOU's operating HPwES programs in Maryland use an implementation vendor to manage the day-to-day operations of the program. There are two implementation vendors in the state, ICF and Honeywell, both of whom were contacted and asked to provide their perspective on the EmPOWER programs and cost-effectiveness considerations. Only one of the two was able to respond within the time constraints of this study. While acknowledging some issues reported in the Itron study (Itron, 2013), several ideas were raised that could improve results in future studies.

Some clarifying statements regarding data reported include:

- HPwES jobs reported include audits and completed projects.
- Reported energy savings include both direct install and comprehensive measures installed in homes.
- An analysis of a HPwES project cycle seems to indicate the shortest cycle is three months assuming everything goes smoothly.
- QHEC audits are primarily performed on multifamily structures. QHEC contractors are paid based upon measures installed thus making multifamily structures most cost-efficient for contractors.

### ***EM&V Contractor***

An interview was conducted with one of authors of the Itron report to gain further understanding as to the assumptions used and thoughts about improving the program. The primary factors impacting the cost-effectiveness, according to the evaluator, were the maximum fifteen year effective useful measure life allowed by the TRM (NEEP, 2011) and the 8% discount rate used in benefit-cost calculations. It was indicated that the PSC mandated use of this discount rate, but further investigation did not reveal any PSC order directing the utilities or the evaluators to use this percentage rate. Other interesting comments include:

- Cost-effectiveness calculated at the sub portfolio level should improve the overall value of the HPwES portfolio

- The PSC was not in favor of the Program Administrator Cost (PAC) test based on a meeting with the PSC earlier in the year
- The PSC is becoming increasingly receptive to valuing non-electricity benefits within the benefit-cost calculations such as natural gas and water, so accounting for this value for relevant measures will be necessary
- Navigant and Cadmus will be determining cost-effectiveness calculations for future program evaluations freeing the evaluation, measurement, and verification (EM&V) contractor to perform just this function. During the 2011 study, Itron had to create assumptions for some measure life spans, energy savings, and costs.
- Itron is almost finished collecting and conducting preliminary analysis on data for the 2012 utility portfolios, but had no preliminary findings at the time of the interview.

The implications from this discussion are that cost-effectiveness impacts from individual and packaged measures will be influenced greatly by determinations made by the Cadmus/Navigant team. Additionally, non-electricity benefits may be more favorably viewed by the PSC, but a rationale must be proposed to quantify them, which makes it difficult to count more qualitative benefits such as comfort.

## **Review of Cost-Effectiveness Tests**

The CSPM (CA PUC, 2001), which is used as the source document in some form for nearly all of the state and utility energy efficiency programs in the United States, describes five basic approaches to benefit-cost evaluation testing:

1. Program Administrator Cost Test (PAC), sometimes referred to as the Utility Cost Test
2. Total Resource Cost Test (TRC)
3. Societal Test
4. Participant Cost Test (PCT)
5. Rate-payer Impact Test (RIM)

As is indicated in the research that is summarized below, the TRC is the most commonly applied test to evaluate energy efficiency programs, however, most states use some combination of tests applied at varying levels (portfolio, program, project, measure) to monitor program performance.

Regarding the appropriate use of cost-effectiveness tests as they relate to home performance programs, NHPC has published two reports (Lebaron, 2012) (Woolf, 2012) articulating recommended modifications to the standard approaches typically used by EM&V contractors. These reports represent the collective work resulting from a series of stakeholder working group activities, interviews, and reviews by the home performance stakeholder community. The goal of these modified approaches to cost-effectiveness tests is to address issues that have been identified since the introduction of performance based and market transformation programs like HPwES to the demand side management program environment. Since even the most recent revisions to the CSPM tests were completed prior to the launch of home performance in 2001, it stands to reason that the CSPM tests are ill-suited to appropriately evaluate the impact of HPwES-type programs.

The key issues associated with home performance and traditional cost-effectiveness tests are described in detail by Knight et al through ACEEE (Knight R. L., 2006) and communications to the California Public Utilities Commission (Knight R. ). These issues include a failure to acknowledge the value of market transformation associated with home performance initiatives as well as an under-valuing of the net benefit to the customer as a result of ignoring non-energy related benefits commonly accepted as key elements of a home performance approach including: improved comfort, building durability, increased property market value, and reduced exposure to health and safety risks.

In 2012, ACEEE published findings from a national survey (Kushler, 2012) of state policies regarding the evaluation of rate-payer funded energy efficiency programs. This survey included 44 states and the District of Columbia. A summary of some of their key findings which may be informative to Maryland's future policy-making follows:

- 100% of respondents use some form of benefit-cost test in connection with rate-payer funded programs.
- 91% of respondents provide some mechanism for other interested parties to be involved in program evaluations. 52% limit this involvement to stakeholder comments (e.g. at public hearings), while a large minority (40%) utilize some kind of formal advisory group.
- 65% of respondents indicated that the evaluation requirements for natural gas energy efficiency programs are the same as for electricity programs.
- 95% of respondents report using a TRC in some form as their "primary" test with the Societal Test (15%) and PAC (12%) making up for most of the remaining sample. Only one state relies primarily on a RIM test and many states consider multiple tests for different purposes.
- 70% of states apply benefit-cost tests at the portfolio and/or program level (many use some combination).
- Discount rates applied to cost-effectiveness calculations range from 2.0% to a high of 8.9%, with a median value of 5.5%. Respondents cite the utility weighted average cost of capital (WACC) as the most prevalent source (49%) followed by long-term U.S. Treasury Bills (17%) and utility and/or customer rate of return (6%).
- The data reported regarding the estimated useful life of measures was not specific enough to generate a meaningful analysis, but the report notes a range of three years for certain O&M measures to 35 years for building shell measures.

The following is a summary of NHPC's recommended modifications to program and portfolio level cost-effectiveness analysis as it could relate to Maryland's EmPOWER programs:

1. **Account for "other program impacts" to the fullest extent possible.** This includes avoided costs, using an appropriate discount rate, capturing spillover effects, and fully accounting for the risk benefits of energy efficiency. Recommended strategies for accomplishing this goal are use of a Societal Test or a TRC with a fully loaded benefits side.

2. **Use a discount rate appropriate to the source of funds.** When determining the value of monetary investments over time, select a discount rate that is appropriate to the source of the funds being used. In the case of HPwES, the funding sources are rate-payers at large for costs associated with program administration and direct incentives, and the individual consumer himself for the homeowner's contribution. As a result, these investments are independent of utility risk factors associated with the discount rate typically applied to energy efficiency programs like WACC. To address this issue, a lower discount rate should be used when evaluating HPwES (and perhaps some other residential programs) which removes the utility's risk profile from the calculation. One simple option for HPwES programs is to use the interest rate currently applied to long-term (10-year) U.S. Treasury Bills<sup>4</sup> as a proxy for the rate-payer/consumer investment risk profile.
3. **Account for free riders, spillover, and market transformation.** Estimated values associated with each of these effects should be developed and applied consistently. Programs with significant market transformation impacts (such as HPwES) should be allowed increased latitude in the benefit-cost analysis to account for those effects.
4. **Select the appropriate test and apply it at the appropriate level.** PAC tests are appropriate at the portfolio level, Societal and TRC tests are appropriate at the program level, and Participant Cost tests are appropriate at the project level.

Implications of these findings and recommended approaches for Maryland are discussed in the Recommendations section of this report.

## **HPwES Sponsor Annual Report Analysis**

In early 2013, DOE conducted an Annual Report data call to all participating HPwES Sponsors. A number of data categories were requested including energy saved and cost of the administration and implementation of programs. For this paper, the Maryland utilities' data for 2012 results was analyzed to attempt to understand their relative performance as compared to the data received from all HPwES Sponsors.<sup>5</sup> It must be noted that DOE HPwES Annual Report data were self-reported by Sponsors and no formal verification was performed on the accuracy of these data. There is some uncertainty regarding the comprehensiveness of the data reported for both costs and savings. On the cost side, some Sponsors have included administrative, marketing, and training budgets into the costs where other Sponsors may not have included all of these expenditures in their calculations. On the savings side, some Sponsors capture only electric savings, some capture electric and gas combined, and some capture all fuels. The data collected for the 2012 period was not granular enough to be able to confidently disaggregate the reported data into more discrete category bins. As a result, the conclusions drawn from this data should be considered in the context of directional guidance rather than providing absolute answers.

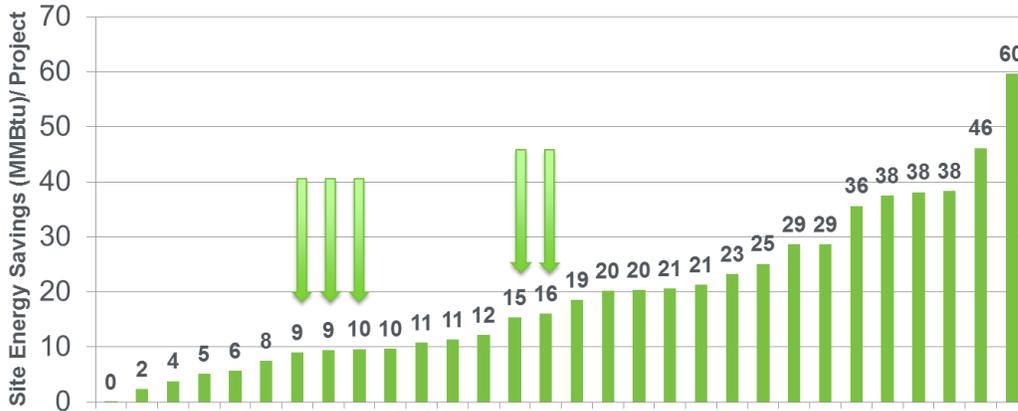
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<sup>4</sup> Although rates change daily, currently, the interest yield on a 10-year U.S. Treasury Bill is 2.5-3.0%

<sup>5</sup> The national HPwES data presented is for calendar year 2012; the program data presented in the Itron 2013 report is for calendar year 2011.

Below, in Figure 4, the range of annual site energy saved per project is presented for the 30 HPwES Sponsors who reported this data for 2012 production. The weighted average across all reporting Sponsors is approximately 21 MMBtu per year per project. All five of the Maryland utilities fall below the weighted average for HPwES ranging from 9-16 MMBtu in average annual savings per project, as indicated by the arrows.

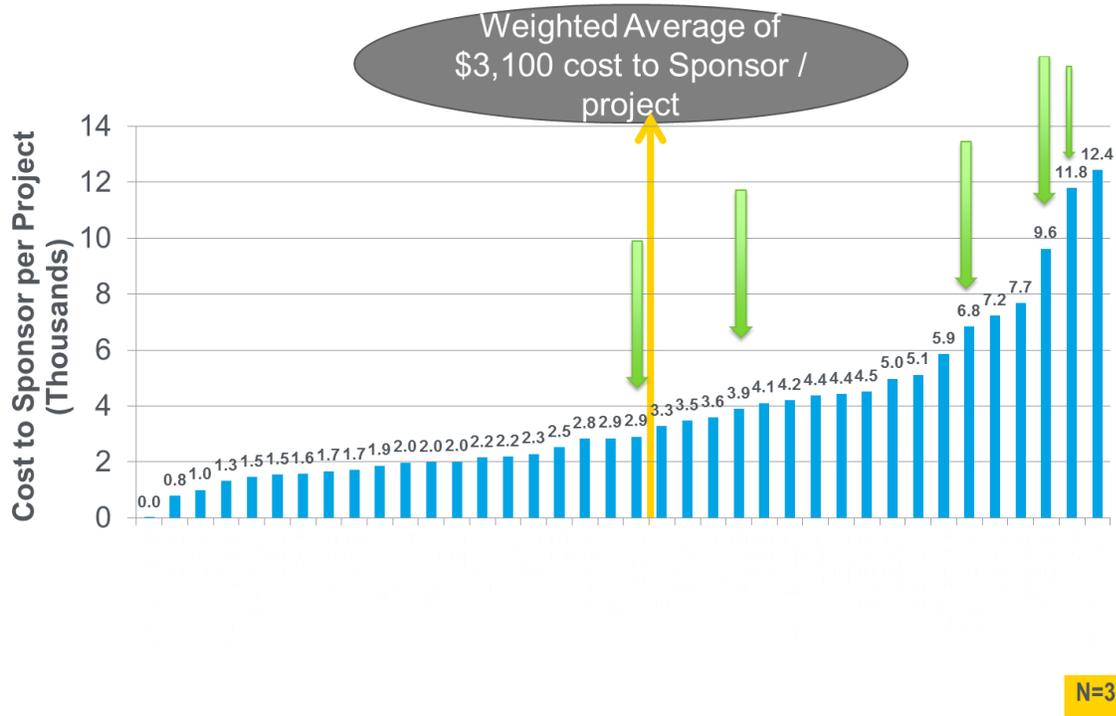
### Annual Site Energy Savings



**Figure 4.** Self-Reported Annual Energy Savings per Project by Sponsor

DOE’s Annual Report data call asked HPwES Sponsors to report on 2012 costs, broken down by administrative costs (including marketing and operational overhead), homeowner incentive costs, and costs for incentives to contractors or other mid-stream actors. Figure 5 displays the range of costs per completed HPwES project as reported by 38 HPwES Sponsors. The weighted average for the cost of a project was \$3,100. The completed project count includes only those projects where improvement measures were installed. With the exception of one Maryland Sponsor, Maryland utilities’ average cost per project exceeded the weighted average, as indicated by the green arrows.

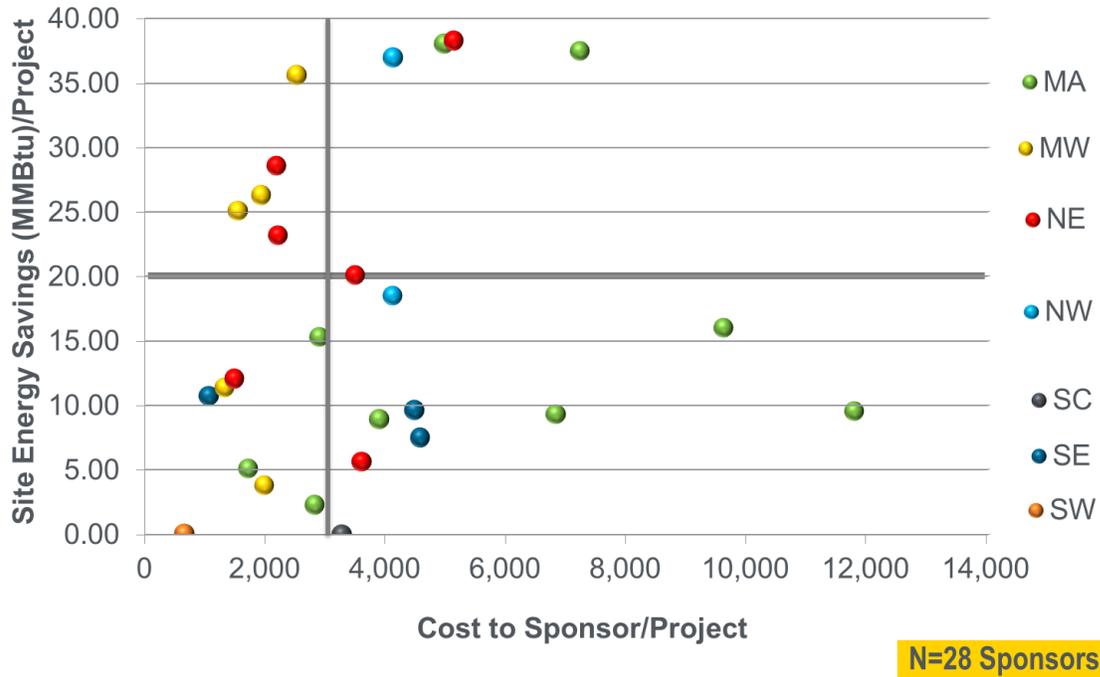
An additional noteworthy result of this data analysis is the wide range of costs reported by the five Maryland Sponsors. Using the combined administrative and incentives costs reported to DOE, the Maryland utilities are spending between \$2,900 and \$11,800 per completed project. Without a more detailed analysis it is not possible to discern exactly why these costs cover such a broad range when the general program designs are similar. It is possible that some Sponsors may be in the process of front-loading spending on marketing or other market and program development activities, or some other factors that are not immediately obvious from the data collected.



**Figure 5.** Self-Reported Average Sponsor Costs per Project

DOE’s Annual Report data for 2012 production allows for comparison of HPwES programs using the average annual savings to average annual costs per project ratio. The performance of all HPwES Sponsors reporting this data using the project savings to cost metric is shown in a graphical representation in Figure 6. In Figure 6, the weighted average costs and savings are indicated by the grey lines. The upper-left quadrant represents the HPwES programs with higher energy savings per project, generated at a lower average cost.<sup>6</sup>

<sup>6</sup> All the Maryland utilities are below the weighted average savings of 20 MMBTus per project; and all but one of the Maryland utilities are above the weighted average cost of \$3,100 per project.



**Figure 6.** Annual Energy Savings to Cost per Project Comparison<sup>7</sup>

When considering the HPwES Programs located within this upper left quadrant, we see several commonalities, including:

- Lower program costs, particularly for administrative costs: Some of these programs reduced administrative costs through auto-proceed and pre-approval procedures; others have lower administrative costs due to their mature infrastructure which assumes more of the costs for lead generation and marketing
- Multi-fuel programs, which are able to account for higher energy savings
- Additional methods to offer financial incentives for homeowners to invest in projects, including on-bill financing, performance based incentives, and low-interest loans
- Provision of contractor-directed incentives for some measures and/or bonus incentives for pursuing deeper energy savings.

Appendix A contains a listing of the eligible measures and incentives currently offered by the Maryland utilities. Appendix B contains a sample of programs in other states which have demonstrated effective models using the energy savings to cost per project as a metric based upon location within the upper-left most quadrant in Figure 6.

<sup>7</sup> Color coding in the chart represents U.S. regional groupings of data as follows: MA = Mid-Atlantic, MW = Mid-West, NE = NorthEast, NW = NorthWest, SC = South Central, SE = SouthEast, SW = SouthWest

## Conclusions and Recommendations

The Maryland HPwES program is facing a rapidly changing environment both locally and nationally. Standards under which work is specified and installed have either undergone recent revision or are being created where none existed before. Chief among these are voluntary standards defining residential energy audits produced by ACCA and BPI, quality assurance and data standards in development by BPI, and the recent release of ASHRAE 62.2-2013 governing ventilation requirements. Additionally, the national HPwES Program, under which the Maryland programs operate, is undergoing revision. Processes for how homes are evaluated pre- and post-improvement, quality assurance, and the metrics by which programs are measured are expected to evolve and change in the near future. These are just a few examples of issues local programs will face over the coming years and the importance of creating program designs that remain agile enough to adapt to new methods and standards as the home performance industry continues to grow and mature.

On a positive note, Maryland has many desirable attributes that should contribute to easing the path to success for its residential programs. The legislative mandate for energy savings in the EmPOWER Act demonstrates the necessary political will within the state while providing motivation to the utilities and the marketplace to make it happen. The PSC has established a flexible regulatory environment allowing the utilities to develop and administer programs relatively unfettered by the dogmatic rule making that often exists in commission-utility relationships. And last, but not least, there exists a trained, qualified, and dedicated workforce ready and willing to deliver home performance services. This combination of rational and aggressive public policy combined with a plug-and-play infrastructure should set the stage for a rapid ramp-up and the long-term success of all of the residential programs including HPwES.

To keep that forward momentum going and ensure that ratepayer funds are spent judiciously and effectively, additional work is needed. The recommendations resulting from the research conducted for this report fall into two general categories: program design and process improvements, and modifications to the evaluation approach used to calculate cost-effectiveness.

### Recommendations for Program Design and Implementation

Many of the recommended process improvements build off of changes that have already been set in motion by the PSC and the utilities. These suggestions mostly revolve around efforts to better coordinate the suite of residential programs and streamlining the processes through which the programs are delivered. The ultimate goal is a combination of increased participation rates, greater energy savings per household, and reduced overhead costs to the programs and the contractors – all while improving the overall experience for the customer.

Table 2 lists recommended program design and process improvements to be considered.

**Table 2. - Recommended Improvements for Program Design and Implementation**

	Recommendations to Improve Program Design and Delivery	Responsible Parties	Suggested Timeframe
1	Remain flexible. The flexibility that currently exists in Maryland’s legislation and regulatory orders offers great opportunity for the EmPOWER programs. For example, the PSC’s willingness to allow for programs with weaker benefit-cost ratios to co-exist with stronger programs as long as the overall portfolio meets b-c targets helps support the development of new and innovative programs and promotes greater savings statewide. Seek to preserve this policy landscape and Maryland will be poised to be a national leader in energy efficiency programming.	Legislature, PSC, IOU’s	Already happening
2	Continue work to standardize the programs statewide. While efforts are already underway, it is important to maintain a certain level of standardization to avoid consumer confusion and overburdening of participating contractors with potentially redundant or conflicting program offers.	IOU’s and implementation vendors	Already started
3	Establish a statewide oversight advisory group and tactical work groups representative of all interested stakeholders to provide oversight and guidance for on-going program development. While a statewide working group was recently formed, the process by which this group gets work done and reports out to the rest of the program community needs to be better established.	MEA, IOU’s	Already started
4	Unify branding and general awareness marketing under a single umbrella program. EmPOWER MD already exists as an identifiable name and should be the brand under which all the IOU’s operate. While each IOU could still maintain a unique identity within EmPOWER MD, the statewide brand should be something that all Maryland residents recognize and seek out as the source for energy efficiency. A unified brand also enables better leveraging of marketing resources among the IOU’s and the state.	MEA, IOU’s	As soon as possible
5	Unify tactical program components that impact the market (e.g. software, data tracking and reporting, qualification requirements for participating contractors, etc.). Start by putting these issues on the agenda for the statewide advisory group and work towards accomplishing these goals over time.	MEA, IOU’s	Begin immediately while producing results over time

	<b>Recommendations to Improve Program Design and Delivery</b>	<b>Responsible Parties</b>	<b>Suggested Timeframe</b>
6	Improve QHEC penetration in the single-family housing market by re-evaluating the pricing structure (are contractors losing money providing QHEC services in single-family homes?), pre-screening customers to identify HPwES customers and bypass QHEC, allow for an encourage upselling of QHEC customers to HPwES and HVAC so contractors can use QHEC projects as a loss leader, and consider enabling HVAC providers to also offer QHEC services.	IOU's, implementation vendors, participating contractors	Begin this process immediately
7	Enable better integration of HPwES and HVAC offers and encourage cross-referrals. The current program structure unintentionally discourages HVAC work from being done on HPwES projects, limiting the energy savings potential for HPwES and offering an incomplete service to homeowners. The HPwES and HVAC offers must be somehow integrated to encourage seamless cross-referrals for customers who need both shell and HVAC improvements.	IOU's, implementation vendors, contractors	Begin this process immediately
8	Enable a broader range of eligible measures for HPwES by establishing guidelines for screening custom packages of measures in the field. This would require the PSC to allow for an alternative screening method (such as energy modeling) to be used in lieu of the calculations required by the TRM.	MEA, PSC, IOU's	Include in next round of recommendations to the PSC
9	Provide a clear gateway to the program with customer screening and guidance for which program path to take. From a practical perspective, this is most likely a website but could also include a call center and perhaps some form of online self-screening tool to assist customers in understanding their options and making the best decision.	MEA, IOU's	Longer term, after program design issues are addressed and the statewide platform is more stable.
10	Encourage and facilitate upselling of QHEC projects to HPwES and cross-referrals to HVAC for qualified customers. If a QHEC contractor is seen as trusted advisor by a customer, then that homeowner should be able to ask that contractor to perform an energy assessment, including a bid for the implementing the recommended energy improvements.	IOU's, implementation vendors	Institute these changes immediately
11	Reinforce the call to action to make a \$100 investment (a \$400 value) by developing clearer messaging to communicate the benefits of HPwES to identify a roadmap for whole-house improvements. Even if it takes time to settle on a unified brand, it is suggested to unify the basic message across utilities	MEA, IOU's	Begin developing this immediately so it can be integrated with all marketing and branding initiatives statewide

	<b>Recommendations to Improve Program Design and Delivery</b>	<b>Responsible Parties</b>	<b>Suggested Timeframe</b>
12	Establish QHEC auditors as ambassadors for all three programs (QHEC, HVAC and HPwES). Train QHEC auditors to identify candidates for HVAC and HPwES and allow them to upsell and function as guides to get customers into the right track as quickly and painlessly as possible.	IOU's, implementation vendors	Begin immediately
13	Develop an "auto-proceed" option for HPwES projects. This could be based on contractor experience and track record, the type or size of the project, or other criteria. The contractor report cards could facilitate implementation of this recommendation.	IOU's, implementation vendors	Begin immediately
14	Establish a source of and facilitate access to a low-interest financing for HPwES projects. This could come through legislative action, PSC order, or from the IOU's themselves. There are many options available, so it is recommended to work through the best options for Maryland with a working group.	Potentially all parties	Assign to a working group to begin exploring options
15	Offer mid-stream incentives to defray the cost of training and certification for participating contractors. This will require agreement among the PSC and IOU's as to how to allocate and value these incentives. The implementation of the contractor report cards could assist in implementation of this recommendation.	PSC, IOU's	Longer term after other related program standardization efforts are completed
16	Develop a performance-based incentive structure for HPwES to allow for custom packaging of measures and encourage deeper energy savings. The implementation of the contractor report cards could assist in implementation of this recommendation.	PSC, IOU's	Begin exploring options now but will require PSC ruling to allow for means other than the TRM to determine eligible measures.
17	Streamline the overall program delivery and participation process, seeking out ways to reduce redundant visits to homes, potential attrition points, and project cycle times (three months is too long.)	IOU's, implementation vendors	Begin this process immediately
18	Consider options for simplified savings prediction models to reduce time spent modeling HPwES projects. When developing procedures for evaluating performance based measure packages, consider options for predicting energy savings that are less time-consuming than whole house energy modeling.	IOU's, implementation vendors	Longer term
19	Incorporate natural gas savings into EmPOWER programs statewide.	Legislature, PSC, IOU's	Longer term

## **Recommendations for Cost-Effectiveness Evaluations**

The underlying cost-effectiveness assumptions, methodologies, and rationale for selecting those approaches for Maryland has not been made entirely transparent to SRA in spite of our efforts to research the issue. Our analysis of the Itron report; the Maryland TRM; and PSC orders, reports, and comments have not revealed any definitive solution to improving the cost-effectiveness of HPwES or the other residential programs. However, this research, along with the stakeholder interviews conducted for this project has revealed several possible contributing factors that should be addressed in an overall effort to ensure the programs are being evaluated accurately and fairly.

For instance, it is unclear why a discount rate of 8.0% was selected for use in the cost-effectiveness evaluation. Without knowing the source or rationale for this decision, it is difficult to predict any potential objections to using a more appropriate discount rate for HPwES. Nonetheless, it is our belief that this is a significant factor in EmPOWER's residential portfolio receiving such dramatically low cost-effectiveness values in Itron's evaluation. Based on ACEEE's national survey (Kushler, 2012) and recommended best practices from the industry (Woolf, 2012), a discount rate of anywhere from 2-5% would be more appropriate and defensible for the HPwES program.

Furthermore, it is our understanding that the Mid-Atlantic TRM, which Maryland uses to calculate estimated measure savings, is in the process of being updated. The TRM is the source used for calculating predicted energy savings on a measure-by-measure basis. Most significantly, the TRM limits the effective useful life (EUL) used for life-cycle analysis to 15 years or less for all measures. In reality, some common HPwES measures, like attic air sealing and insulation, should be evaluated based on a significantly longer timeline as these measures are effectively permanent improvements to the home. ACEEE's research indicates that some states allow for EULs as long as 35 years for some measures. It is our recommendation that these values be reviewed and revised appropriately for use in Maryland regardless of the final outcome of the TRM revisions.

Additionally, the Mid-Atlantic TRM assumes a baseline for heating and cooling equipment as system operation at the federal minimum standard, e.g. SEER 13 for a central AC. While this makes sense for new construction and the installation of new systems, it is not representative of efficiency gains from installing replacement systems. The majority of replaced systems are believed to operate at efficiencies significantly below their nominal rating; so if the efficiency of the existing system is tested (either in the HVAC program or HPwES), there should be a mechanism for capturing the additional savings from energy reductions realized from moving from the actual operating condition up to the federal minimum in addition to the incremental step from the federal minimum to Energy Star. The incremental costs prescribed in the TRM are based on installing a new system so it only accounts for the price differential between a new SEER 13 and a new high efficiency system. This effectively equates to the delta in the cost associated with the condenser unit alone for a central AC or heat pump. HVAC program standards are based on AHRI's tiered rating system for AC system efficiencies which require the outdoor condenser to match the indoor evaporator coil, the air handler, and the refrigerant

metering device, e.g. TXV valve. TRM-based incremental costs may not account for the costs of these additional components, if required.

In addition, the PSC has clarified that cost-effectiveness should be evaluated at the sub-portfolio level which means that residential programs will be evaluated under a collective cost-effectiveness value. While it is still important to monitor individual program performance, it is appropriate public policy to evaluate the sub-portfolio as a whole, allowing for lower performing programs to co-exist with higher performing programs and continue to contribute to the overall statewide energy savings goals.

While the majority of the recommendations that follow are directly associated with the inputs and approach to calculating cost-effectiveness values, a couple of key recommendations are related both to program implementation and cost-effectiveness screening of measures. The recommendations in this latter category merit some additional explanation. Currently, the program incentive designs are based on a list of pre-qualified measures that have passed a cost-effectiveness screening based the calculations in the TRM. While this approach helps to peg incentive amounts and provides a consistent basis for claimed energy savings, it also falls short when applied to a whole-house program like HPwES. For a HPwES program to reach its full potential, it is important for contractors to develop customized work-scopes for their customers based on the specific conditions of the home and the individual customer's needs. Ideally, the cost-effectiveness screening for these custom packages should be aligned with the transaction that occurs between the contractor and the customer.

Additionally, when packaging measures for a whole house work scope it is often necessary to include measures which might not pass the screening on their own but are necessary to enable other more cost-effective measures to be installed. Last, but not least, the individual measure screening applied by the TRM approach does not effectively address the issue of interactivity of energy savings when measures are combined. Interactivity occurs when the savings from one measure is offset by the impact of another measure. For instance, if CFLs are installed to replace incandescent light bulbs, there is an impact on both the heating and cooling loads in the building which wouldn't typically be captured in a measure-level screening. If whole-building energy modeling is applied, interactive effects are typically accounted for within that analysis.

Using a measure package screening based on a consumer-friendly metric like a savings to investment ratio (SIR) directly addresses the issues noted above and also enables the introduction of performance-based incentives. A performance-based program can be leveraged to ensure that minimum savings thresholds are achieved and also to promote deeper energy savings by offering graduated incentive schedules based on predicted energy savings.

Note that there are some key details to consider when establishing a performance based program. First, it may be necessary to require SIRs greater than 1.0 at the project level to ensure that the program remains cost-effective after accounting for all other evaluation factors. Additionally, it is important for modeled energy savings to be calibrated or "trued up" using the actual energy consumption history of the home. This true up process helps to ensure that predicted energy savings are realized. BPI's recently published standard BPI-2400 (BPI, 2012) provides standards that may be applied to calibrate these models.

Finally, some of the recommendations listed below address issues related to data capture and tracking. It is especially important in a state managing multiple programs toward meeting a collective goal that data is documented and reported in a standardized way. As can be seen by the data collected by the national HPwES Program, the utilities operating HPwES programs in Maryland there is wide variation in data for both costs and energy savings claimed. If a standard set of rules were applied to the collection, tracking, and reporting of this type of data statewide, it would make future evaluations far more meaningful and make it easier to identify trends in program performance across all program administrators and regions. It is also important to note that there are several national efforts currently underway to assist in the standardization of data collection and data transfer protocols (BPI, 2013) (BPI, 2013) related to residential energy efficiency and the industry is slowly moving toward a goal of establishing data systems that can use real energy consumption data pre and post retrofit to measure and validate energy savings from programs. Maryland is poised to be at the forefront of those kinds of efforts if a statewide data collection system could be implemented.

Several recommendations are offered as described in Table 3.

**Table 3. - Recommended Improvements for Cost-Effectiveness Evaluations**

Recommendations to Improve Cost-Effectiveness Evaluations	
1	Make sure net-to-gross ratios offer a fair representation of the unique aspects of HPwES including the amount of effort that goes into upselling customers from simpler programs (indicating few, if any, real free riders) and the market transformation effects that HPwES is based on (indicating great potential for spillover effects).
2	Include a means for accounting for the higher cost of acquisition of renewable energy to satisfy RPS requirements vs. energy efficiency.
3	Establish a reasonable discount rate to be used in cost-effectiveness calculations.
4	Re-evaluate the effective useful life factors included in the TRM. Many of the EULs assigned to shell measures are too short (e.g. 15 years for insulation and air sealing, which are effectively permanent measures).
5	Account for easily quantifiable non-electric savings (natural gas, water, and delivered fuels) for all projects when using a TRC.
6	Consider possible methods for capturing non-energy benefits when using a TRC. Do not use 100% of the customer's contribution on the cost side without balancing the benefit side appropriately. Consumers do not make their spending decisions based solely on energy savings.
7	Allow for alternative screening methods (such as energy modeling with an SIR threshold) to be used in lieu of the calculations required by the TRM. Use SIR (effectively a participant cost test) for eligibility screening of HPwES measure packages.
8	Establish a standard process and tools for statewide data tracking of HPwES projects including pre and post-installation energy consumption. This data can be used later for impact evaluations and ultimately to inform better program design in the future.
9	Develop uniform guidelines for utility tracking of program costs and savings to enable "apples to apples" comparisons in future evaluations.
10	Investigate the reasons for Maryland's HPwES programs claiming lower than the national average in energy savings per project.
11	Investigate the reasons for the very broad range in costs reported by Maryland's HPwES

	programs.
12	Develop a mechanism for using measured operating efficiencies of heating and cooling equipment as the baseline when determining savings estimates as opposed to the federal minimum standard efficiencies as prescribed in the TRM. Many existing systems pre-date the current federal minimums and most installed systems do not actually operate at their nominal efficiencies. If the actual operating efficiency is measured before and after retrofits, this data should be used to determine the net improvement.
13	Review the cost estimates prescribed in the TRM and adapt them as needed to accurately reflect the cost of replacement systems. The incremental cost assumptions in the TRM are based on new system installation which does not include the added costs associated with bringing all system components into compliance with the AHRI tier specifications currently required by the program. Further study is warranted to determine the implications of this issue on the rebate structure and program requirements.

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## Appendix A: Maryland HPwES Measures and Incentives by Utility

Sponsor	State			
BGE	MD			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Comprehensive Home Energy Audit (CHEA)	BGE SMART ENERGY Savers	Cost reduced to \$100 (75% savings)	Improvements must be completed within 12 months of the audit	Homeowner
HPwES/Air Sealing	BGE SMART ENERGY Savers	50% up to \$2K max. for all measures	20% reduction if BAS $\geq 125\%$ , 20% reduction + ventilation if BAS $< 125\%$ , SIR $\geq 0.8$ if less than 20% reduction	Homeowner
HPwES/attic insulation – flat	BGE SMART ENERGY Savers	50% up to \$2K max. for all measures	Existing $\leq R20$ and be brought up to R38, If existing $> R20$ then SIR $\geq 0.8$	Homeowner
HPwES/other (attic slope/wall insulation, ext. wall insulation, rim joist insulation, tankless water heater installation, etc.	BGE SMART ENERGY Savers	50% up to \$2K max. for all measures	Cost/benefit eligibility as determined by Beacon software	Homeowner
Direct Install/CFLs	BGE SMART ENERGY Savers	Up to 12 free ENERGY STAR labeled CFLs	High-use incandescent bulbs existing used $> 4$ hours/day	Homeowner
Direct Install/ Electric Water Heater Tank Wrap	BGE SMART ENERGY Savers	Install R-6.7 tank wrap insulation	Tank R-value $< R-12$	Homeowner
Direct Install/ DHW pipe insulation	BGE SMART ENERGY Savers	Install min. $\frac{3}{4}$ " thick for 6' from water heater	No heat trap	Homeowner
Direct Install/ Efficient-flow showerheads	BGE SMART ENERGY Savers	Install devices $\leq 1.8$ gpm, up to two	Existing showerhead(s) must be $\geq 2.5$ gpm	Homeowner

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Sponsor	State			
<b>BGE</b>	<b>MD</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
		showerheads		
Direct Install/ Faucet aerators	BGE SMART ENERGY Savers	Install devices ≤ 1.5 gpm, up to 4 faucets	Existing faucet(s) must be ≥ 2.5 gpm	
HVAC/Central AC tier 1	BGE SMART ENERGY Savers	\$150 rebate	Min. 14.5 SEER, 12 EER	Homeowner or contractor
HVAC/Central AC tier 2	BGE SMART ENERGY Savers	\$300 rebate	Min. 15 SEER, 12.5 EER	Homeowner or contractor
HVAC/Central AC tier 3	BGE SMART ENERGY Savers	\$500 rebate	Min. 16 SEER, 13 EER	Homeowner or contractor
HVAC/Heat Pump tier 1	BGE SMART ENERGY Savers	\$200 rebate	Min. 14 SEER, 12 EER, 8.2 HSPF	Homeowner or contractor
HVAC/Heat Pump tier 2	BGE SMART ENERGY Savers	\$300 rebate	Min. 15 SEER, 12.5 EER, 8.5 HSPF	Homeowner or contractor
HVAC/Heat Pump tier 3	BGE SMART ENERGY Savers	\$500 rebate	Min. 16 SEER, 13 EER, 9 HSPF	Homeowner or contractor
HVAC/Geothermal Heat Pump (closed system)	BGE SMART ENERGY Savers	\$500 rebate	Min. 17.1 EER, 3.06 COP	Homeowner or contractor
HVAC/Gas Furnace tier 1	BGE SMART ENERGY Savers	\$300 rebate	92% AFUE w/ ECM	Homeowner or contractor
HVAC/Gas Furnace tier 2 w/ quality installation	BGE SMART ENERGY Savers	\$400 rebate	92% AFUE w/ ECM and QI	Homeowner or contractor
Ductless Mini-Split A/C	BGE SMART ENERGY Savers	\$300 rebate		Homeowner or contractor
Ductless Mini-Split Heat Pump	BGE SMART ENERGY Savers	\$500 rebate		Homeowner or contractor
Duct Sealing	BGE SMART ENERGY Savers	\$250 rebate	50% leakage documented reduction, or leakage < ACCA Standard or 20% of airflow	Homeowner or contractor
Cooling Efficiency Improvement	BGE SMART ENERGY Savers	\$100 rebate	Reference BGE's HVAC Cooling Efficiency	Homeowner or contractor

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Sponsor	State			
<b>BGE</b>	<b>MD</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
			Improvement Performance Worksheet	

Sponsor	State			
<b>Pepco</b>	<b>MD</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Comprehensive Home Energy Audit	Pepco HPwES Program	Cost reduced to \$100 (@75% savings)		Homeowner
HPwES/Air Sealing	Pepco HPwES Program	50% up to \$2K		Homeowner
HPwES/ Insulation	Pepco HPwES Program	50% up to \$2K		Homeowner
HPwES/ Windows	Pepco HPwES Program	50% up to \$2K	Must include home air sealing and/or insulation improvements	Homeowner
Direct Install	Quick Home Energy Check-up Program	May include: CFLs, tank wrap and pipe wrap for electric water heaters, low-flow showerheads, faucet aerators, power strips	Available with Quick Home Energy Check-up	Homeowner
Discounted Lighting	Pepco Lighting Program	Discounts on ES Certified CFLs (up to \$2.25), LEDs (up to \$10), and compatible fixtures (up to \$10)	Available at participating retailers	Homeowner
Appliances: Clothes Washer	Pepco Appliance Rebate Program	\$50 rebate	ES certified clothes washer	Homeowner
Appliances: Clothes Washer	Pepco Appliance Rebate Program	\$100 rebate	ES certified clothes washer w/ MEF ≥ 2.2 and WF ≤ 4.5	Homeowner
Appliances: Dehumidifier	Pepco Appliance Rebate Program	\$25 rebate	ES certified dehumidifier	Homeowner
Appliances: Electric Heat	Pepco Appliance Rebate Program	\$350 rebate	ES certified electric heat	Homeowner

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Sponsor	State			
Pepco	MD			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Pump Water Heater	Program		pump water heater	
Appliances: Electric Water Heater	Pepco Appliance Rebate Program	\$25 rebate	Electric water heater EF $\geq 0.93$	Homeowner
Appliances: Freezer	Pepco Appliance Rebate Program	\$75 rebate	ES qualified freezer	Homeowner
Appliances: Refrigerators	Pepco Appliance Rebate Program	\$100 rebate	ES certified refrigerator	Homeowner
Appliances: Refrigerators	Pepco Appliance Rebate Program	\$150 rebate	ES certified refrigerator w/ efficiency rating $\geq 25\%$ better than federal standard	Homeowner
Appliances: Room A/C	Pepco Appliance Rebate Program	\$25 rebate	ES qualified room A/C	Homeowner
Appliances: Recycling	Pepco Appliance Recycling Program	\$50 rebate	Recycle old working refrigerator or freezer	Homeowner
Appliances: Recycling	Pepco Appliance Recycling Program	\$25 rebate	Recycle old working room A/C at same time as recycling refrigerator or freezer	Homeowner
HVAC/ Performance Tune-up	Pepco HVAC Efficiency Program	\$100 rebate	By participating contractor; HVAC unit must operate at $\geq 90\%$ efficiency	Homeowner
HVAC/ Duct Sealing	Pepco HVAC Efficiency Program	\$250 rebate	By participating contractor	Homeowner
HVAC/ Electric Central A/C	Pepco HVAC Efficiency Program	\$150 rebate	$\geq 14.5$ SEER & $\geq 12$ EER	Homeowner
HVAC/ Electric Central A/C	Pepco HVAC Efficiency Program	\$300 rebate	$\geq 15$ SEER & $\geq 12.5$ EER	Homeowner
HVAC/ Electric Central A/C	Pepco HVAC Efficiency Program	\$500 rebate	$\geq 16$ SEER & $\geq 13$ EER	Homeowner
HVAC/ Electric Air Source Heat Pump	Pepco HVAC Efficiency Program	\$200 rebate	$\geq 14.5$ SEER & $\geq 12$ EER & $\geq 8.2$ HSPF	Homeowner

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Sponsor	State			
Pepco	MD			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
HVAC/ Electric Air Source Heat Pump	Pepco HVAC Efficiency Program	\$300 rebate	≥15 SEER & ≥ 12.5 EER & ≥ 8.5 HSPF	Homeowner
HVAC/ Electric Air Source Heat Pump	Pepco HVAC Efficiency Program	\$500 rebate	≥16 SEER & ≥ 13 EER & ≥ 9 HSPF	Homeowner
HVAC/ Geothermal Heat Pump (Closed Loop)	Pepco HVAC Efficiency Program	\$500 rebate	≥17.1 EER & ≥ 3.6 COP	Homeowner
HVAC/ Ductless Mini Split A/C	Pepco HVAC Efficiency Program	\$300 rebate	≥16 SEER & ≥ 13 EER	Homeowner
HVAC/ Ductless Mini Split Heat Pump	Pepco HVAC Efficiency Program	\$300 rebate	≥16 SEER & ≥ 13 EER & ≥ 9 HSPF	Homeowner

Sponsor	State			
Delmarva Power	MD			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Comprehensive Home Energy Audit	Delmarva Power HPwES Program	Cost reduced to \$100 (@75% savings)		Homeowner
HPwES/Air Sealing	Delmarva Power HPwES Program	50% up to \$2K		Homeowner
HPwES/ Insulation	Delmarva Power HPwES Program	50% up to \$2K		Homeowner
HPwES/ Windows	Delmarva Power HPwES Program	50% up to \$2K	Must include home air sealing and/or insulation improvements	Homeowner
Direct Install	Quick Home Energy Check-up Program	May include: CFLs, tank wrap and pipe wrap for electric water heaters, low-flow showerheads, faucet aerators, power strips	Available with Quick Home Energy Check-up	Homeowner
Discounted Lighting	Delmarva Power Lighting	Discounts on ES Certified	Available at participating	Homeowner

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Sponsor	State			
<b>Delmarva Power</b>	<b>MD</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
	Program	CFLs (up to \$2.25), LEDs (up to \$10), and compatible fixtures (up to \$10)	retailers	
Appliances: Clothes Washer	Delmarva Power Appliance Rebate Program	\$50 rebate	ES certified clothes washer	Homeowner
Appliances: Clothes Washer	Delmarva Power Appliance Rebate Program	\$100 rebate	ES certified clothes washer w/ MEF $\geq$ 2.2 and WF $\leq$ 4.5	Homeowner
Appliances: Dehumidifier	Delmarva Power Appliance Rebate Program	\$25 rebate	ES certified dehumidifier	Homeowner
Appliances: Electric Heat Pump Water Heater	Delmarva Power Appliance Rebate Program	\$350 rebate	ES certified electric heat pump water heater	Homeowner
Appliances: Electric Water Heater	Delmarva Power Appliance Rebate Program	\$25 rebate	Electric water heater EF $\geq$ 0.93	Homeowner
Appliances: Freezer	Delmarva Power Appliance Rebate Program	\$75 rebate	ES qualified freezer	Homeowner
Appliances: Refrigerators	Delmarva Power Appliance Rebate Program	\$100 rebate	ES certified refrigerator	Homeowner
Appliances: Refrigerators	Delmarva Power Appliance Rebate Program	\$150 rebate	ES certified refrigerator w/ efficiency rating $\geq$ 25% better than federal standard	Homeowner
Appliances: Room A/C	Delmarva Power Appliance Rebate Program	\$25 rebate	ES qualified room A/C	Homeowner
Appliances: Recycling	Delmarva Power Appliance Recycling Program	\$50 rebate	Recycle old working refrigerator or freezer	Homeowner
Appliances: Recycling	Delmarva Power Appliance Recycling Program	\$25 rebate	Recycle old working room A/C at same time as recycling refrigerator or freezer	Homeowner
HVAC/ Performance Tune-up	Delmarva Power HVAC Efficiency Program	\$100 rebate	By participating contractor; HVAC unit must operate at $\geq$	Homeowner

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Sponsor	State			
<b>Delmarva Power</b>	<b>MD</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
			90% efficiency	
HVAC/ Duct Sealing	Delmarva Power HVAC Efficiency Program	\$250 rebate	By participating contractor	Homeowner
HVAC/ Electric Central A/C	Delmarva Power HVAC Efficiency Program	\$150 rebate	≥14.5 SEER & ≥ 12 EER	Homeowner
HVAC/ Electric Central A/C	Delmarva Power HVAC Efficiency Program	\$300 rebate	≥15 SEER & ≥ 12.5 EER	Homeowner
HVAC/ Electric Central A/C	Delmarva Power HVAC Efficiency Program	\$500 rebate	≥16 SEER & ≥ 13 EER	Homeowner
HVAC/ Electric Air Source Heat Pump	Delmarva Power HVAC Efficiency Program	\$200 rebate	≥14.5 SEER & ≥ 12 EER & ≥ 8.2 HSPF	Homeowner
HVAC/ Electric Air Source Heat Pump	Delmarva Power HVAC Efficiency Program	\$300 rebate	≥15 SEER & ≥ 12.5 EER & ≥ 8.5 HSPF	Homeowner
HVAC/ Electric Air Source Heat Pump	Delmarva Power HVAC Efficiency Program	\$500 rebate	≥16 SEER & ≥ 13 EER & ≥ 9 HSPF	Homeowner
HVAC/ Geothermal Heat Pump (Closed Loop)	Delmarva Power HVAC Efficiency Program	\$500 rebate	≥17.1 EER & ≥ 3.6 COP	Homeowner
HVAC/ Ductless Mini Split A/C	Delmarva Power HVAC Efficiency Program	\$300 rebate	≥16 SEER & ≥ 13 EER	Homeowner
HVAC/ Ductless Mini Split Heat Pump	Delmarva Power HVAC Efficiency Program	\$300 rebate	≥16 SEER & ≥ 13 EER & ≥ 9 HSPF	Homeowner

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Sponsor	State			
Potomac Edison	MD			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Home Performance Audit	Potomac Edison HPwES	Cost reduced to \$100 (@75% savings)	Participating contractor	Homeowner
HPwES: Insulation	Potomac Edison HPwES	50% (program max \$2000)	Participating contractor	Homeowner
HPwES: Air Sealing	Potomac Edison HPwES	50% (program max \$2000)	Participating contractor	Homeowner
HPwES: Duct Sealing	Potomac Edison HPwES	50% (program max \$2000)	Participating contractor	Homeowner
HPwES: Window Upgrade	Potomac Edison HPwES	50% (program max \$2000)	Participating contractor	Homeowner
Discounted Lighting	Potomac Edison Lighting Discounts and Rebates	Discounts on ES Certified CFLs (up to \$2.25), CFL fixtures (up to \$10), and LEDs (up to \$10)	Available at participating retailers	Homeowner
Lighting Rebates	Potomac Edison Lighting Discounts and Rebates	\$30 rebate	ES qualified LED fixture	Homeowner
Lighting Rebates	Potomac Edison Lighting Discounts and Rebates	\$15 rebate	ES qualified torchiere floor lamp	Homeowner
Lighting Rebates	Potomac Edison Lighting Discounts and Rebates	\$10 rebate	ES qualified CFL fixtures	Homeowner
Lighting Rebates	Potomac Edison Lighting Discounts and Rebates	\$10 rebate	Energy saving sensor equipped surge protectors	Homeowner
Appliances: Clothes Washer	Potomac Edison ES Appliance Rebates	\$100 rebate	ES certified clothes washer	Homeowner
Appliances: Dehumidifier	Potomac Edison ES Appliance Rebates	\$25 rebate	ES certified dehumidifier	Homeowner
Appliances: Freezer	Potomac Edison ES Appliance Rebates	\$75 rebate	ES qualified freezer	Homeowner
Appliances: Refrigerator - Freezers	Potomac Edison ES Appliance Rebates	\$150 rebate	ES certified refrigerator	Homeowner
Appliances: Room A/C	Potomac Edison ES Appliance Rebates	\$25 rebate	ES qualified room A/C	Homeowner
Appliances: Electric Heat Pump Water Heater	Potomac Edison Appliance Rebates	\$350 rebate	electric heat pump water heater EF ≥ 2.0	Homeowner

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Sponsor	State			
Potomac Edison	MD			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Appliances: Electric Water Heater	Potomac Edison Appliance Rebates	\$25 rebate	Electric water heater EF ≥0.93	Homeowner
Appliances: Recycling	Potomac Edison Appliance Recycling Program	\$50 rebate	Recycle old working refrigerator or freezer (limit 1 each per year)	Homeowner
Appliances: Recycling	Potomac Edison Appliance Recycling Program	\$25 rebate	Recycle old working room A/C (limit 3 per yr)	Homeowner
HVAC/ Electric Central A/C	Potomac Edison HPwES	\$150 rebate	≥14.5 SEER & ≥ 12 EER	Homeowner
HVAC/ Electric Central A/C	Potomac Edison HPwES	\$300 rebate	≥15 SEER & ≥ 12 EER	Homeowner
HVAC/ Electric Central A/C	Potomac Edison HPwES	\$500 rebate	≥16 SEER & ≥ 12 EER	Homeowner
HVAC/ Electric Air Source Heat Pump	Potomac Edison HPwES	\$200 rebate	≥14.5 SEER & ≥ 12 EER & ≥ 8.5 HSPF	Homeowner
HVAC/ Electric Air Source Heat Pump	Potomac Edison HPwES	\$300 rebate	≥15 SEER & ≥ 12 EER & ≥ 8.5 HSPF	Homeowner
HVAC/ Electric Air Source Heat Pump	Potomac Edison HPwES	\$500 rebate	≥16 SEER & ≥ 12 EER & ≥ 8.5 HSPF	Homeowner
HVAC/ Geothermal Heat Pump	Potomac Edison HPwES	\$500 rebate	ES qualified	Homeowner
HVAC/ Ductless Mini Split A/C	Potomac Edison HPwES	\$300 rebate	≥15 SEER & ≥ 12 EER	Homeowner
HVAC/ Ductless Mini Split Heat Pump	Potomac Edison HPwES	\$300 rebate	≥16 SEER & ≥ 12 EER & ≥ 8.5 HSPF	Homeowner
HVAC/ Whole House Fan	Potomac Edison HPwES	\$100 rebate	1000 cfm; home must have central A/C or heat pump	Homeowner

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Sponsor	State			
SMECO	MD			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Home Energy Audit	SMECO HPwES	Cost reduced to \$100 (@75% savings)	Participating contractor	Homeowner
HPwES/Air Sealing	SMECO HPwES for Homeowners	50% up to \$2K max. for all measures	20% reduction in Whole House air Sealing	Homeowner
HPwES/attic insulation	SMECO HPwES for Homeowners	50% up to \$2K max. for all measures	A starting attic insulation R-Value of <R-20 must be improved to R-38	Homeowner
Direct Install/CFLs	SMECO HPwES for Homeowners	Install ES labeled CFLs		Homeowner
Direct Install/ Electric Water Heater Tank Wrap	SMECO HPwES for Homeowners	Install R-6.7 tank wrap insulation		Homeowner
Direct Install/ DHW pipe insulation	SMECO HPwES for Homeowners	Install min. ¾" thick for all pipes within 6' of water heater		Homeowner
Direct Install/ Efficient-flow showerheads	SMECO HPwES for Homeowners	Install devices ≤ 1.75 gpm		Homeowner
Direct Install/ Faucet aerators	SMECO HPwES for Homeowners	Install devices ≤ 1.5 gpm		Homeowner
HVAC/Central AC tier 1	SMECO Residential Heating and Cooling Rebate Program	\$150 rebate	≥ 14.5 SEER & ≥12 EER	Homeowner
HVAC/Central AC tier 2	SMECO Residential Heating and Cooling Rebate Program	\$300 rebate	≥ 15 SEER & ≥ 12.5 EER	Homeowner
HVAC/Central AC tier 3	SMECO Residential Heating and Cooling Rebate Program	\$500 rebate	≥ 16 SEER & ≥ 13 EER	Homeowner
HVAC/Heat Pump tier 1	SMECO Residential Heating and Cooling Rebate Program	\$200 rebate	≥ 14.5 SEER & ≥ 12 EER & ≥ 8.2 HSPF	Homeowner

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Sponsor	State			
<b>SMECO</b>	<b>MD</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
HVAC/Heat Pump tier 2	SMECO Residential Heating and Cooling Rebate Program	\$300 rebate	≥ 15 SEER & ≥ 12.5 EER & ≥ 8.5 HSPF	Homeowner
HVAC/Heat Pump tier 3	SMECO Residential Heating and Cooling Rebate Program	\$500 rebate	≥ 16 SEER & ≥ 13 EER & ≥ 9 HSPF	Homeowner
HVAC/Geothermal Heat Pump (closed system)	SMECO Residential Heating and Cooling Rebate Program	\$500 rebate	≥ 17.1 EER & ≥ 3.06 COP	Homeowner
HVAC/ Ductless Mini-Split A/C	SMECO Residential Heating and Cooling Rebate Program	\$300 rebate	≥ 16 SEER & ≥ 13 EER	Homeowner
HVAC/ Ductless Mini-Split Heat Pump	SMECO Residential Heating and Cooling Rebate Program	\$300 rebate	≥ 16 SEER & ≥ 13 EER & ≥ 9 HSPF	Homeowner
HVAC/ Duct Sealing	SMECO Residential Heating and Cooling Rebate Program	\$250 rebate	Properly sealing air ducts	Homeowner
Performance Tune-Up	SMECO Residential Heating and Cooling Rebate Program	\$100 rebate	Extensive evaluation and improvement of an existing cooling system	Homeowner

## **Appendix B: High Performing HPwES Programs**

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Sponsor	State			
<b>Dominion East Ohio HPwES</b>	<b>OH</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Home Energy Assessment	DEO HPwES	Reduced to \$50		Homeowner
NG Furnace Upgrade	DEO HPwES	Up to \$400	Maximum 2 per house	Homeowner
NG Water Heater Upgrade	DEO HPwES	Up to \$150	Maximum 2 per house	Homeowner
Insulation Upgrade	DEO HPwES	\$.30/ft2 no max	Must heat with nat. gas	Homeowner
Air Sealing Upgrade	DEO HPwES	\$40/hr. no max	Permanent sealing required Must heat with nat. gas	Homeowner
Duct Sealing Upgrade	DEO HPwES	\$40/hr. no max	Duct tape disallowed Must heat with nat. gas	Homeowner
Exterior Door Upgrade	DEO HPwES	\$30/door	R-4.4 or greater Must heat with nat. gas	Homeowner
Window Door Upgrade	DEEO HPwES	\$5/window	ES labeled for region Must heat with nat. gas No maximum	
Thermostat Upgrade	DEO HPwES	\$30/thermostat (\$60 max)		Homeowner
Ventilation Fan	DEO HPwES	\$15/fan	ES labeled Must vent to exterior	Homeowner

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Sponsor	State			
<b>Efficiency Vermont</b>	VT			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Energy Audit	EVHPwES 2013 Incentives	\$100 discount	HPwES contractor	Homeowner
Appliances: Clothes Washer	Efficiency Vermont Rebates	\$40 rebate	CEE Tier 3 Specifications	Homeowner
Appliances: Clothes Washer	Efficiency Vermont Rebates	\$75 rebate	CEE Tier 3 Specifications and ES Most Efficient or Top Ten USA	Homeowner
Appliances: Dehumidifier	Efficiency Vermont Rebates	\$25 rebate	Select ES certified models (limit 1)	Homeowner
Appliances: Refrigerators	Efficiency Vermont Rebates	\$40 rebate	CEE Tier 2 Specifications	Homeowner
Appliances: Refrigerators	Efficiency Vermont Rebates	\$75 rebate	CEE Tier 3 Specifications or ES Most Efficient 2013 Specs	Homeowner
Appliances: Refrigerator Recycling	Efficiency Vermont Rebates	\$50 rebate	Clean, empty, and in working condition (limit 2)	Homeowner
Lighting	Efficiency Vermont Partnership	LED discounts or \$10 coupon	Partnered lighting retailers offer specially priced LEDs or \$10 instant coupon	Retailer/Homeowner
Swimming Pool Pump	Efficiency Vermont Rebates	\$200 rebate	Qualifying 2-speed/variable-speed pump	Homeowner
Air Sealing: Minimum	EVHPwES 2013 Incentives	\$250 incentive (project max \$2100)	Air Leakage Reduction $\geq$ 10% and install recommended H&S improvements	Homeowner
Air Sealing: Additional	EVHPwES 2013 Incentives	\$250 in addition to min. incentive (project max \$2100)	Air Leakage Reduction 20 - 35%	Homeowner
Air Sealing: Additional	EVHPwES 2013 Incentives	\$500 in addition to min. incentive (project max \$2100)	Air Leakage Reduction >35%	Homeowner
Insulation: Attic Flat	EVHPwES 2013 Incentives	\$.30/sf Incentive (project max \$2100)	Increase from $\leq$ R-16 to $\geq$ R-49	Homeowner

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Sponsor	State			
<b>Efficiency Vermont</b>	VT			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Insulation: Foundation/Rim Joists	EVHPwES 2013 Incentives	\$.50/sf Incentive (project max \$2100)	Increase from $\leq$ R-6 to $\geq$ R-15	Homeowner
Insulation: Other Locations	EVHPwES 2013 Incentives	\$.50/sf Incentive (project max \$2100)	Increase from $\leq$ R-6 to $\geq$ R-12; or, increase from between $>$ R-6 and $\leq$ R-8 to $\geq$ R-18; or, increase from between $>$ R-8 and $\leq$ R-16 to $\geq$ R-49	Homeowner
Heat Distribution Improvement Incentive	EVHPwES 2013 Incentives	\$75 (project max \$2100)	Install min \$200 of duct sealing, leak repair, boiler pipe insulation, or other heat distribution improvements	Homeowner
Heat System Replacement Incentive	EVHPwES 2013 Incentives	\$500 (project max \$2100)	Replace existing with more efficient system	Homeowner
Comprehensive Retrofit Bonus Package Incentive	EVHPwES 2013 Incentives	\$250 (project max \$2100)	Reduce air leakage by $\geq$ 35% and install insulation $\geq$ 75% of home's finished floor area – must meet other Insulation Incentive criteria	Homeowner
Other Bonus Incentive	EVHPwES 2013 Incentives	\$500	Complete all improvements before 8/31/13	Homeowner

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Sponsor	State			
<b>Energy Trust of Oregon</b>	<b>OR</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Energy Audit	Energy Trust Incentives	\$150 rebate	HPwES contractor comprehensive assessment (including CAZ, air leakage and duct leakage testing)	Homeowner
Appliances: Energy Saver Kit	Energy Trust Incentives	Free Energy Saver Kit	CFLs, shower & faucet aerators, etc.	Homeowner
Appliances: Refrigerator or Freezer Recycling	Energy Trust Incentives	\$40 cash	10-30 cu. ft. and in working condition (limit 3)	Homeowner
Air Sealing:	Savings Within Reach Incentives	\$150 incentive (deducted from invoice)	BD test required	Contractor
Air Sealing: Air Leakage Test	Savings Within Reach Incentives	Free	One free test per customer	Homeowner
Insulation: Attic	Savings Within Reach Incentives	\$550 incentive (deducted from invoice)	If $\leq$ R-12, increase to R-38	Contractor
Insulation: Wall	Savings Within Reach Incentives	\$550 incentive (deducted from invoice)	If $\leq$ R-4, increase to R-11 or fill cavity	Contractor
Insulation: Floor	Savings Within Reach Incentives	\$550 incentive (deducted from invoice)	If R-0, increase to R-30 or fill cavity	Contractor
Heating: High Efficiency Heat Pump Upgrade	Savings Within Reach Incentives	\$550 incentive (deducted from invoice)	Min efficiency HSPF 9.0	Contractor
Heating: High Efficiency Heat Pump Upgrade	Savings Within Reach Incentives	\$750 incentive (deducted from invoice)	Min efficiency HSPF 9.0, replacing an electric furnace	Contractor
Heating: Ductless (Inverter type) Heat Pump Upgrade	Savings Within Reach Incentives	\$1000 incentive (deducted from invoice)	Must replace electric resistance or electric furnace as primary heat source	Contractor
Heating: HE Gas Furnace	Savings Within Reach Incentives	\$550 incentive (deducted from invoice)	$\geq$ 90% AFUE, must be using gas as primary heat source	Contractor
Water Heating: Gas Tank	Water Heating Professional Install Incentives	\$125 - \$150 incentive (deducted from invoice)	ES qualified $\geq$ 0.67 EF	Contractor

*An Analysis of Utility-Sponsored Home Performance with ENERGY STAR® Programs in Maryland  
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Sponsor	State			
<b>Energy Trust of Oregon</b>	<b>OR</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Water Heating: Heat Pump	Water Heating Professional Install Incentives	\$500 incentive (deducted from invoice)	Only eligible hp water heaters, must replace an electric water heater	Contractor
Water Heating: Electric Tank	Water Heating Professional Install Incentives	\$75 incentive (deducted from invoice)	≥ 0.94 EF, 20 yr manufacturer warranty (hp and hybrid water heaters excluded)	Contractor
Water Heating: Electric Tank	Water Heating Professional Install Incentives	\$35 incentive (deducted from invoice)	≥ 0.93 EF	Contractor
Water Heating: Solar	Water Heating Professional Install Incentives	\$550 incentive (deducted from invoice)	Zone 1 with gas backup	Contractor
Water Heating: Solar	Water Heating Professional Install Incentives	\$700 incentive (deducted from invoice)	Zones 2 & 3 with gas backup	Contractor
Water Heating: Solar	Water Heating Professional Install Incentives	\$1000 incentive (deducted from invoice)	Zone 1 w/ electric backup	Contractor
Water Heating: Solar	Water Heating Professional Install Incentives	\$1200 incentive (deducted from invoice)	Zones 2 & 3 with electric backup	Contractor
Water Heating: Electric Tank	Water Heating Self-Install	\$35 Incentive	≥ 0.93 EF	Homeowner
Water Heating: Electric Tank	Water Heating Self-Install	\$75 Incentive	≥ 0.94 EF, 20 yr manufacturer warranty (hp and hybrid water heaters excluded)	Homeowner
Appliances: Outdoor Spa Cover	Energy Trust Incentives	\$100 Incentive	≥ R-12 from participating retailers (heating must be NG or electric)	Homeowner
Appliances: Clothes Washers	Energy Trust Incentives	\$50 Cash Back	ES w/ MEF of 2.4 – 2.59	Homeowner

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Sponsor	State			
<b>Energy Trust of Oregon</b>	<b>OR</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Appliances: Clothes Washers	Energy Trust Incentives	\$70 Cash Back	ES w/ MEF of $\geq 2.6$	Homeowner
Appliances: Refrigerators	Energy Trust Incentives	\$75 Incentive	ES $\geq 30\%$ above federal standards	Homeowner
Appliances: Freezers	Energy Trust Incentives	\$35	ES	Homeowner

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Sponsor	State			
LEAP	VA			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Home Energy Improvements	LEAP 90 Days of Summer	20% of EE improvement costs up to \$500	For Arlington Co. homeowners only; Must utilize a LEAP certified contractor, ensure energy savings of ≥ 20%, and nominate home for Home Performance with ENERGY STAR Program	Homeowner
Home Energy Improvements	LEAP 90 Days of Summer	20% of EE improvement costs up to \$450	For Central Virginia homeowners only; Must utilize a LEAP certified contractor, ensure energy savings of ≥ 10%, and nominate home for Home Performance with ENERGY STAR Program	Homeowner

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Sponsor	State			
Mass Save	MA			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Home Energy Assessment	Mass Save	No-cost	Residential customers, 1-4 family homes	Homeowner
Insulation	Mass Save	75% up to \$2000	Approved improvements	Homeowner
Air Sealing	Mass Save	No-cost	Targeted air sealing	Homeowner
Central AC / Air Source Heat Pump	Cool Smart Residential Rebates	\$150 rebate	≥ 14.5 SEER, ≥ 12 EER, ≥ 8.2 HSPF	Homeowner
Central AC / Air Source Heat Pump	Cool Smart Residential Rebates	\$300 rebate	≥ 15 SEER, ≥ 12.5 EER, ≥ 8.5 HSPF	Homeowner
Central AC / Air Source Heat Pump	Cool Smart Residential Rebates	\$500 rebate	≥ 16 SEER, ≥ 13 EER, ≥ 8.5 HSPF	Homeowner
Ductless Mini-Split Heat Pump	Cool Smart Residential Rebates	\$150 rebate	≥ 16 SEER, ≥ 12 EER, ≥ 8.2 HSPF	Homeowner
Ductless Mini-Split Heat Pump	Cool Smart Residential Rebates	\$300 rebate	≥ 19 SEER, ≥ 12.5 EER, ≥ 10 HSPF	Homeowner
Ductless Mini-Split Heat Pump	Cool Smart Residential Rebates	\$500 rebate	≥ 20 SEER, ≥ 13 EER, ≥ 10 HSPF	Homeowner
Heating Controls: Boiler Reset Controls	Mass Save – GasNetworks '13 Rebates	\$225 rebate	Add on to NG existing boiler	Homeowner
Heating Controls: Programmable Thermostat	Mass Save – GasNetworks '13 Rebates	\$25 rebate	Limit 2	Homeowner
Heating Controls: Wi-Fi Thermostats	Mass Save – GasNetworks '13 Rebates	\$100 rebate	Limit 2, Wi-Fi must be enabled	Homeowner
Heating: NG Furnace w/ ECM	Mass Save – GasNetworks '13 Rebates	\$450 rebate	≥ 97% AFUE	Homeowner
Heating: NG Furnace w/ ECM	Mass Save – GasNetworks '13 Rebates	\$300 rebate	≥ 95% AFUE	Homeowner
Heating: NG Boiler	Mass Save – GasNetworks '13 Rebates	\$1500 rebate	≥ 95% AFUE	Homeowner
Heating: NG Boiler	Mass Save – GasNetworks '13 Rebates	\$1000 rebate	≥ 90% AFUE	Homeowner

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Sponsor	State			
Mass Save	MA			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Heating: Condensing Boiler w/ On-Demand DHW	Mass Save – GasNetworks '13 Rebates	\$1200 rebate	≥ 90% AFUE	Homeowner
NG Water Heating: On-Demand Tankless	Mass Save – GasNetworks '13 Rebates	\$800 rebate	≥ .94 EF w/ Elec Ignition	Homeowner
NG Water Heating: On-Demand Tankless	Mass Save – GasNetworks '13 Rebates	\$500 rebate	≥ .82 EF w/ Elec Ignition	Homeowner
NG Water Heating: ES Qualified Storage	Mass Save – GasNetworks '13 Rebates	\$100 rebate	≥ .67 EF	Homeowner
NG Water Heating: Condensing	Mass Save – GasNetworks '13 Rebates	\$500	≥ 95% Thermal Efficiency	Homeowner
NG Water Heating: Indirect	Mass Save – GasNetworks '13 Rebates	\$400 rebate	Must be connected to NG Boiler	Homeowner
HRV	Mass Save – GasNetworks '13 Rebates	\$500 rebate	Qualified HRV	Homeowner
Loan	Mass Save Heat Loan	0% up to 7 years, \$25k max	From participating lenders for qualified EE improvements	Homeowner
Refrigerator or Freezer Recycling	MASS Save	\$50 Incentive	10-30 cu. ft., must be a secondary unit, clean, empty, working, and accessible	Homeowner
Water Heating: Heat Pump Water Heater	MASS Save	Up to \$750 rebate	New construction or replace existing electric tank	Homeowner
Heating: Boiler – Forced Hot Water, NG or LPG	Early Boiler Replacement Rebate	\$3500 rebate (Owner occupied), \$4000 rebate (Non-Owner occupied)	≥ 90% AFUE to replace ≥ 30 year old existing	Homeowner/Building Owner
Heating: Boiler – Steam, NG, LPG, or Oil	Early Boiler Replacement Rebate	\$1900 rebate	≥ 82% AFUE to replace ≥ 30 year old existing	Homeowner/Building Owner
Heating: Boiler – Forced Hot Water, Oil	Early Boiler Replacement Rebate	\$1750 rebate	≥ 85% AFUE to replace ≥ 30 year old existing	Homeowner/Building Owner

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Sponsor	State			
<b>Mass Save</b>	<b>MA</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
ES Appliances: Air Purifier	Mass Save ES Offers	\$40 rebate	ES certified, from participating retailer	Homeowner
ES Appliances: Refrigerator	Mass Save ES Offers	\$30 rebate	ES qualified	Homeowner
ES Appliances: Refrigerator	Mass Save ES Offers	\$50 rebate	ES qualified and TopTen USA listed	Homeowner
ES Appliances: Freezer	Mass Save ES Offers	\$20 rebate	ES qualified	Homeowner
ES Appliances: Freezer	Mass Save ES Offers	\$25 rebate	ES qualified and TopTen USA listed	Homeowner
ES Appliances: CFLs and LEDS	Mass Save ES Offers	Special In-Store Pricing	Participating Retailers	Homeowner
ES Appliances: Light Fixtures	Mass Save ES Offers	Special In-Store Pricing	Participating Retailers	Homeowner
ES Appliances: Advanced Power Strip	Mass Save ES Offers	Discounted Pricing	Energy Federation Online Store	Homeowner
ES Appliances: Swimming Pool Pumps	Mass Save ES Offers	\$200 rebate	ES qualified	Homeowner
ES Appliances: Room A/C	Mass Save ES Offers	\$25 instant rebate	ES certified at participating retailers	Homeowner
Deep Energy Retrofit: Roof/Attic	National Grid Deep Energy Retrofit Pilot Incentives	\$3.00/ft <sup>2</sup> treated area	National Grid territory	Homeowner
Deep Energy Retrofit: Exterior Wall	National Grid Deep Energy Retrofit Pilot Incentives	\$3.50/ft <sup>2</sup> treated area	National Grid territory	Homeowner
Deep Energy Retrofit: Basement	National Grid Deep Energy Retrofit Pilot Incentives	\$2.00/ft <sup>2</sup> treated area	National Grid territory	Homeowner
Deep Energy Retrofit: Performance Incentive	National Grid Deep Energy Retrofit Pilot Incentives	\$1.75/cu. ft. per minute (CFM50) reduced	National Grid territory	Homeowner

*An Analysis of Utility-Sponsored Home Performance with ENERGY STAR® Programs in Maryland  
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Sponsor	State			
NH Saves	NH			
Incentive Category	Program Name			Targeted Customer
Energy Audit	NH Saves (various utilities)	Cost reduced to \$100, fee waived if improvements are done	Qualified Liberty Utilities Rep	Homeowner
Air Sealing, Duct Sealing and Insulation	NH Saves (various utilities)	50% up to \$4k	Qualified contractor, NG customers only	Homeowner
Heating Controls: Boiler Reset Controls	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$225 rebate	Add on to NG existing boiler	Homeowner
Heating Controls: Programmable Thermostat	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$25 rebate	Limit 2	Homeowner
Heating Controls: Wi-Fi Thermostats	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$100 rebate	Limit 2, Wi-Fi must be enabled	Homeowner
Heating: NG Furnace w/ ECM	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$450 rebate	≥ 97% AFUE	Homeowner
Heating: NG Furnace w/ ECM	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$300 rebate	≥ 95% AFUE	Homeowner
Heating: NG Boiler	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$1500 rebate	≥ 95% AFUE	Homeowner
Heating: NG Boiler	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$1000 rebate	≥ 90% AFUE	Homeowner
Heating: Condensing Boiler w/ On-Demand DHW	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$1200 rebate	≥ 90% AFUE	Homeowner
NG Water Heating: On-Demand Tankless	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$800 rebate	≥ .94 EF w/ Elec Ignition	Homeowner
NG Water Heating: On-Demand Tankless	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$500 rebate	≥ .82 EF w/ Elec Ignition	Homeowner
NG Water Heating: ES Qualified Storage	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$100 rebate	≥ .67 EF	Homeowner
NG Water Heating: Condensing	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$500	≥ 95% Thermal Efficiency	Homeowner

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Sponsor	State			
NH Saves	NH			
Incentive Category	Program Name			Targeted Customer
NG Water Heating: Indirect	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$400 rebate	Must be connected to NG Boiler	Homeowner
HRV	NH Saves (var. utilities) – GasNetworks ‘13 Rebates	\$500 rebate	Qualified HRV	Homeowner
Cooling: Air Source or Ductless Mini Split Heat Pump	NH Saves (var. utilities)	\$450 rebate	≥ 14.5 SEER, ≥ 12 EER, ≥ 8.2 HSPF	Homeowner
Cooling: Air Source or Ductless Mini Split Heat Pump	NH Saves (var. utilities)	\$900 rebate	≥ 19 SEER, ≥ 12.5 EER, ≥ 10 HSPF	Homeowner
Cooling: Central Air, Ductless Mini Split (Cooling only)	NH Saves (var. utilities)	\$200 rebate	≥ 14.5 SEER, ≥ 12 EER	Homeowner
ES Appliances: Clothes Washer	NH Saves	\$30 rebate	ES certified (limit 1)	Homeowner
ES Appliances: Refrigerator	NH Saves	\$30 rebate	ES certified (limit 1)	Homeowner
ES Appliances: Room Air Conditioner	NH Saves	\$20 rebate	ES certified (limit 2)	Homeowner
ES Appliances: Air Purifier	NH Saves	\$15 rebate	ES certified (limit 1)	Homeowner
ES Appliances: Advanced Power Strip	NH Saves	\$10 in store coupon	Participating Retailers	Homeowner
Refrigerator Recycling	NH Saves (var. utilities)	\$30 rebate	From electric utility	Homeowner

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Sponsor	State			
NYSERDA	NY			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Comprehensive Home Energy Assessment	NYSERDA HPwES	\$50 to \$250 discount	Discount dependent on household income	Homeowner
Building Shell: Air Sealing	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Building Shell: Insulation (attic, wall, floor, band joist, basement, crawl space)	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Appliances: Dehumidifier	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	\$75 max	Homeowner
Appliances: Freezer	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	\$300 max	Homeowner
Appliances: Refrigerators	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	\$300 max	Homeowner
Appliances: Room A/C	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	\$50 max	Homeowner
Appliances: CFLs & LEDs	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households		Homeowner
Conservation: Faucet Aerators & Low Flow Showerheads	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households		Homeowner
Primary HVAC System: Furnace – Natural Gas	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner

*An Analysis of Utility-Sponsored Home Performance with ENERGY STAR® Programs in Maryland  
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Sponsor	State			
<b>NYSERDA</b>	<b>NY</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
Primary HVAC System: Furnace - LP	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Furnace – Fuel Oil	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Boiler - Condensing	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Boiler – Hot Water	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Boiler - Steam	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Boiler Reset Controls	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Distribution Improvements in Oil or Propane Heated Homes	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Duct Sealing	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Pipe Insulation	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Primary HVAC System: Central Air Conditioner	NYSERDA HPwES	10% cash back	Program limit \$3000	Homeowner

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Sponsor	State			
<b>NYSERDA</b>	<b>NY</b>			
Incentive Category	Program Name	Incentive Level	Notes on Incentive	Targeted Customer
(split system)				
Primary HVAC System: Programmable Thermostat	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Water Heater: Propane or Oil	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Water Heater: Indirect- Fired Tank	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Water Heater: Heat Pump Water Heaters	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Water Heater: Pipe Insulation	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Water Heater: Hot Water Tank Insulation – Oil or Propane	NYSERDA HPwES	10% cash back, or 50% Assisted Subsidy Grant for income eligible households	Program limit \$3000, or \$5000 limit for Assisted Subsidy Grant	Homeowner
Smart Energy Loan – All Listed Improvements		Up to 15% of improvement cost (max \$2000)	3.99%, or 3.49% w/ auto pay	Homeowner
On-Bill Recovery Loan – All Listed Improvements		Monthly payment not to exceed 1/12 <sup>th</sup> estimated annual cost savings from improvements	3.49%, repaid by installment charges on utility bill	Homeowner
Assisted Loan – All Listed Improvements		Rate reduction of up to 4% less than normal interest rate	Max. \$20k, term 10 years	Homeowner