DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
HOUSING AND BUILDING ENERGY PROGRAMS

Multifamily Energy Efficiency and Housing Affordability Program Guide

6/11/2019

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1. Introduction

The purpose of this document is to provide guidance throughout the funding process for the Maryland Department of Housing and Community Development's (the Department) multifamily energy efficiency and conservation programs. These programs are administered by the Department's Housing and Building Energy Programs division (HBEP). This Program Guide includes sections that define the roles and responsibilities for the Department, Property Owners, Auditors, and Contractors. This document should be read by each party to fully understand the roles and responsibilities of each and the cross-communication required for the most efficient and effective application and use of program funds.

The guidance in this document is based on the Department's direct experience with energy efficiency and conservation improvements in multifamily buildings, implementation of energy efficiency programs, industry standards for multifamily building energy audits and upgrades, and third party program evaluation findings. Key references include standards and program guidelines from the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE), the Building Performance Institute (BPI), the New York State Energy Research and Development Authority (NYSERDA), the U.S. Department of Energy (DOE), and the U.S. Environmental Protection Agency's ENERGY STAR program. That said, state and locally applicable building codes and standards take precedence over the general guidance found in this document. Projects funded through the Department must comply with current building and energy codes, standards, green building programs, and the requirements of the specific funding sources for any project.

The Department allocates funding for multifamily energy efficiency and conservation projects. Funding sources include but are not limited to Maryland's EmPOWER utility rate payer funding for Baltimore Gas and Electric (BGE), Delmarva Power, Potomac Electric Power Company (PEPCO), Potomac Edison (PE) and Washington Gas (WG). The Department provides these funds in accordance with funding source requirements to conserve energy and reduce the utility cost burden for limited income residents and property owners in Maryland.

❖ NOTE – Funding source requirements may change at any time and without prior notice. Guidance will be updated and disseminated through the Auditor Qualification Form annually.

1.1. Process Overview

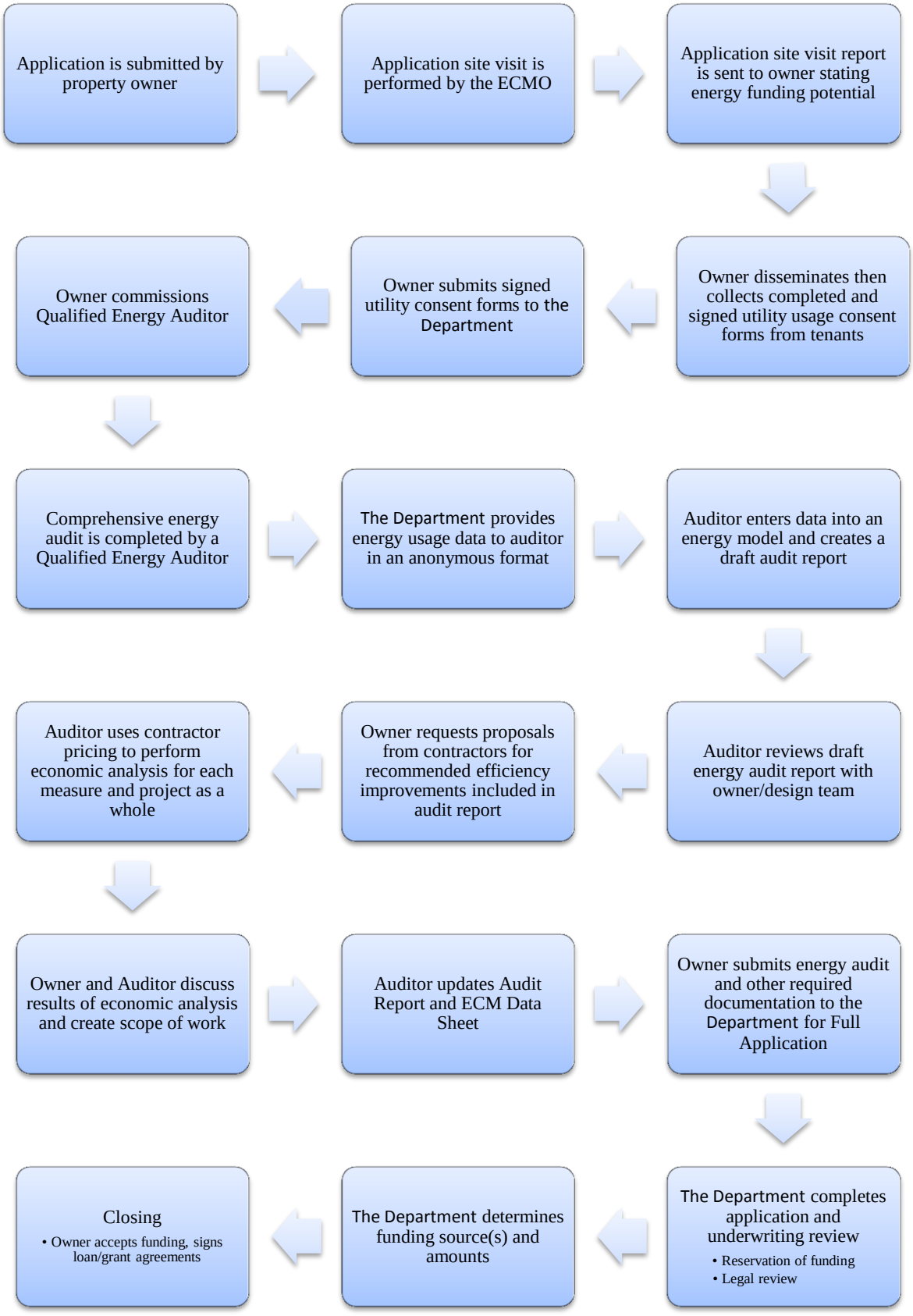
The flow charts below outline the typical steps for getting a project to completion, including the:

- application;
- audit;
- installation; and
- verification process.

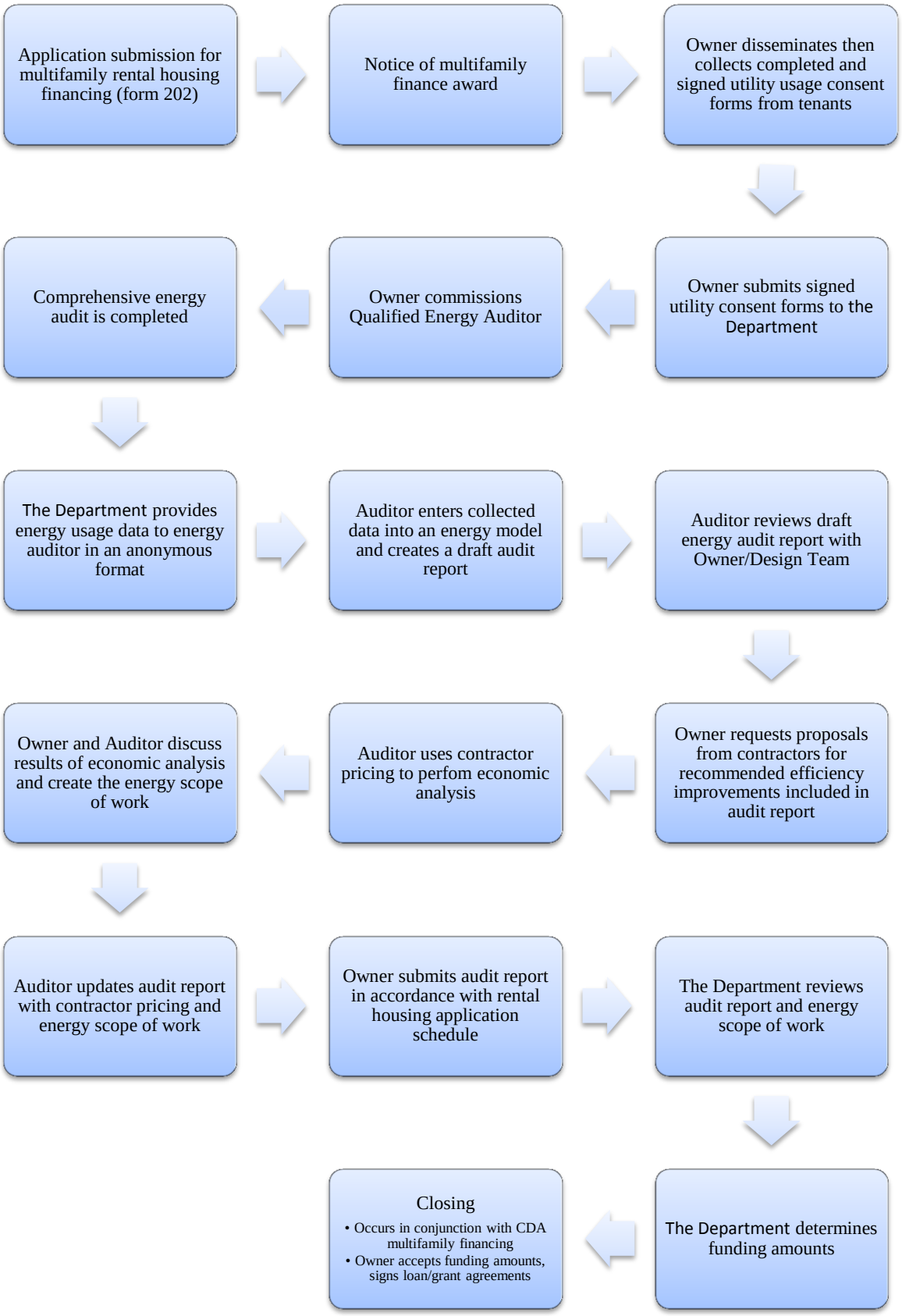
Projects are categorized into two different types:

1. Retrofit - projects performing only energy efficiency improvements.
2. Pipeline - projects seeking financing through the Department's Community Development Administration (CDA) for rehabilitation and/or new construction; this may include Low Income Housing Tax Credits (LIHTC), Rental Housing Funds (RHF), energy efficiency and conservation funds, or other sources.

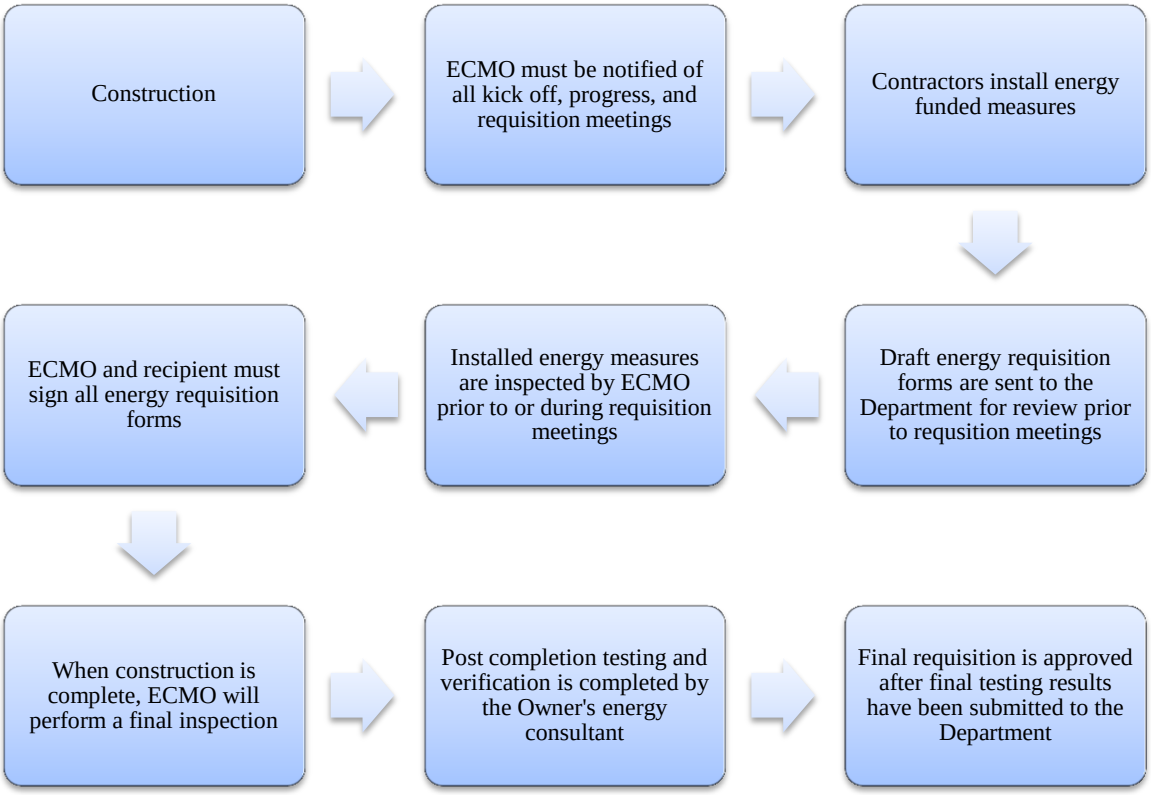
1.2. Retrofit Process (Application)



1.3. Pipeline Process (Application)



1.4. Construction Process (Both Retrofit and Pipeline Projects)



2. Department of Housing and Community Development

The Department determines and approves funding by reviewing application documents, energy audit reports and proposed savings, diagnostic testing results and proposed product specification sheets. Approved projects will have installed measures inspected before the Department will disburse funds for requisitions.

Funds are distributed only to a project owner, as either a grant or loan. Funds are disbursed, through requisitions, only as a reimbursement for actual costs incurred for installed measures up to the approved amount(s) and for approved measure(s).

2.1. Members of the Department

Members of the Department include:

- EMO: An Energy Management Officer provides applicants with administrative support through the application, grant/loan closing, and requisition processes. The EMO's duties and responsibilities may include, but are not limited to:
  - Receive, review and determine eligibility for application packages
  - Conduct application meeting or phone conferences to discuss applicant requirements and eligibility (if requested by the applicant)
  - Coordinate underwriting and legal review of application package
  - Coordinate grant/loan closing
  - Process requisition submissions and coordinate payment with the finance department

- ECMO: An Energy Construction Management Officer provides technical guidance to owners, contractors, and auditors throughout the project's various stages including application, construction, and requisitioning. The ECMO's duties and responsibilities may include, but are not limited to:
  - Application site visit and report
  - Determine eligibility for energy funding
  - Review audit report and ECM data sheets
  - Determine appropriate funding source(s) and amounts
  - Perform site visits and inspections throughout construction
  - Verify the installation of energy measures
  - Provide on-site training at ECMO's discretion
  - Attend requisition and in-progress meetings
  - Approve requisitions after installed measures have been inspected
  - Review third party post completion testing and verification results
  - Approve final requisition and release of retention

2.2. Application

Applications are submitted as an Application Package containing the documents required for application package review. An application package is required only for retrofit projects; pipeline project application review is integrated with CDA's Rental Housing Finance application process. The application is received and reviewed by an EMO and an ECMO is assigned to the project once the application is determined to pass the review.

2.2.1. Retrofit Projects

An application package[1] is submitted electronically by the applicant to MultifamilyEnergy.DHCD@Maryland.gov. The application package includes:

- Completed Multifamily Energy Efficiency and Housing Affordability Application
  - All fields must be complete
- Proof of Affordability
- Organization Documentation
  - A copy of all documents that identify the organization structure and owners/partners
- Copy of owners commercial electric bill for the property

2.2.2. Application Package Review

The Department reviews each Application Package for completeness and to determine property eligibility for funding based on the property:

- Location;
- Utility provider;
- Utility meter structure;
- Affordability restrictions (Regulatory Agreements);
- Prior participation in energy programs (funding sources may have restrictions for how frequently a participant can participate in a given program. Example: EmPOWER only allows participation once every 5 years);
- Prior or future property rehabilitation; and
- Available funding.

The EMO will contact the applicant if further information is required. The EMO assigns eligible projects to an ECMO for an application site visit.

2.2.3. Pipeline Projects

The energy application and review process is integrated with the Department's application and underwriting for other rental housing financing through the Department. A separate energy funding application is not required. In addition to items required under the Department's rental housing financing application, the owner must provide a copy of the project's commercial electric bill.

[1] http://dhcd.maryland.gov/HousingDevelopment/Pages/EnergyEfficiencyWeatherization.aspx

2.2.4. Application Site Visit (Retrofit Projects Only)

- Conducted by an ECMO
- Assess the project for potential savings opportunities and determine potential eligibility for energy funding.

❖ Applicants for Pipeline projects may find an application site visit beneficial when considering requesting energy funds for their project.

2.2.5. Application Site Visit Report

An application site visit report is provided to the owner by the ECMO. The report:

- Includes potential for energy funding;
- Provides a recommendation whether to continue with the application process or not;
- Includes a list of potential opportunities the energy auditor must consider, evaluate, and include in their comprehensive list of improvements; and
- Is intended to be reviewed by the auditor prior to the energy audit being performed.

If the report recommends moving forward with an energy audit, the owner should commission a qualified auditor to complete the comprehensive energy audit. The Department will not accept an energy audit from an Energy Auditor not found on the Department's Qualified Energy Auditor List.

2.2.6. Utility Consent Forms

Consent forms[2] are necessary to allow the program to acquire actual utility customer consumption data and enable the program to more accurately estimate project savings. Forms are not for property owner or management purposes.

- Sent to property owner/applicant:
  - Retrofit: with application site visit report if the report recommends moving forward with an energy audit
  - Pipeline: after eligibility for energy funding has been determined
- Utility consent forms must be completed and signed by the:
  - tenant(s); and
  - owner, for owner utility information
- Property owners must send completed and signed utility consent forms to the EMO or ECMO.

[2] Consent forms can be found at http://dhcd.maryland.gov/HousingDevelopment/Documents/Energy_Usage_Information.pdf

2.2.7. Energy Use Data

The Department will provide the auditor with energy use data when Utility Consent Forms are received for the project.

- Data is provided in an anonymous format so individual tenant information is not disclosed.
- The auditor uses this data to "true-up" the building energy model estimated consumption with actual building consumption.
- The auditor updates any previous versions of the audit report or economic analysis based on actual energy use data.

2.3. Full Application

An application is considered "full" when all documentation is received by the Department and underwriting and legal review can begin. The following is required to be submitted for consideration as a full application:

2.3.1. Retrofit Projects:

Submit the following:

- Credit report;
  - Must be less than 365 days old
- Minority Business Enterprise (MBE) form;
- Resolutions/Incumbency Certificate;
- Signed Owner/Commercial Space Utility Consent Form;
- Signed Certificate of Good Standing; and
  - Must be less than 30 days old
- Energy audit.

In addition to the application documents listed above, several documents are required prior to the start of construction. These documents can be submitted any time (as a package of documents) prior to construction but are not required prior to the execution of the grant or loan. The construction documents include:

- W9 Tax ID form;
- Contractor Licenses for each contractor;
- Permits or signed statement that permits are not required for the Energy funded work;
- Liability Insurance;
- Property Insurance; and
- Product Specification Sheets for all products to be installed.

2.3.2. Pipeline projects

The energy funding application process is integrated with the Department's application underwriting for rental housing financing. The required documents are submitted in accordance with the underwriting schedule set by the rental housing financing project Underwriter.

2.4. Energy Audit and Scope of Work Review

All energy audit reports are reviewed for compliance with program guidance (including rental housing financing application requirements) to determine reasonableness and reliability of presented data.

2.4.1. The Department reviews all energy audit reports and resulting Scopes of Work and will:

- Request more information as needed; and
- Provide feedback to auditors and owners.

2.4.2. A satisfactory review will result in identification of:

- Funding source(s);
- Eligible measures;
- Funding amount; and
- Any required applicant cost sharing.

2.4.3. Pipeline projects

Energy funded measures must be listed on the 215 Form stating the measure description, quantity, and funding amount for each measure funded.

2.5. Closing Process

The term "closing process" refers to the process of executing the grant or loan documents and begins with the reservation of funds. The initial funding amount reserved is based on initial documentation and the energy audit review results. A reservation letter is issued, signed, and returned to the Department. The Department's underwriting team, along with the Office of the Attorney General, reviews all documents and upon approval, loan/grant documents will be issued. The project is considered "closed" when all parties have signed the grant or loan documents. The project can then move into the construction phase.

2.5.1. Reservation of Funds

A notice will be sent to the applicant stating funds have been reserved for the project contingent on underwriting and legal review.

- Reservation notice issued (awardee has 10 business days to sign and return reservation notice)
  - Funding amounts are reserved for 30 days post-notice of reservation, during which the owner provides all remaining documentation required to issue the Grant Agreement.

❖ The receipt of a reservation notice does not guarantee funds. The reservation notice places the project in reservation status and project funding will be approved on a first-ready, first-served basis.

2.6. Underwriting and Legal Review

All application documentation is subject to review by the EMO assigned to the project and the Office of the Attorney General.

Retrofit Project Required Documentation:

- Organizational documents including bylaws and partnership agreements for all entities including the owner of the property, awardee (if different), and managing members;
- Regulatory agreement;
- Signed resolutions and incumbency certificate;
- Certificate of good standing (signed and submitted within 30 days of executed grant agreement);
- SDAT Real Property Search to confirm address;
- Historic Review; and
- W9 Tax ID form.

Pipeline Projects: energy funding underwriting and legal review is integrated with the Department's application underwriting and legal review for rental housing financing.

2.7. The Agreement

After the legal review, the Office of the Attorney General, on behalf of the Department, will draft the loan or grant agreement. The draft agreement will be circulated for signature and returned to the Department. Once the Department receives the signed agreement, the project is considered "closed".

Additional documents are required to be submitted to the Department after the Agreement has been signed for Retrofit projects:

- Contractor Licenses for each contractor;
- Permits or signed statement that permits are not required;
- Liability Insurance; and
- Property Insurance.

2.8. Construction

Work may begin on the project after funds are approved and an Agreement is executed.

- The EMCO must be notified of the construction start date.
- The ECMO must be notified of all progress and requisition meetings.
- Specification sheets for materials and products must be submitted and approved by the ECMO before purchasing for the project.
    - Specification sheets are reviewed to confirm measures to be installed match the approved measures in the Agreement.
    - Failure to follow this process may cause measures to have reduced funding or have funding completely rejected for any unapproved measure(s).

2.9. Requisitioning for Funds

A requisition is the official claim for reimbursement of completed work. Funds are only disbursed on a reimbursement basis for installed work. Owners request funding by completing an energy requisition form and submitting it to the ECMO. A complete and accurate requisition documenting the proper use

of funds and supporting documentation will ensure a more timely requisition payment. Energy requisition forms are created and supplied by the ECMO after the loan/grant agreement has been executed.

2.9.1. Proper use and application of funds

- Funds can only be used for the measures identified in the Exhibit B of the loan or grant agreement.
- Installed appliances and materials must be no less efficient than the efficiencies identified in the Exhibit B.
- Unexpended funds cannot be used for activities not identified in Exhibit B.

2.9.2. Schedule for Requisitions

Only approved measures that are installed on the project at the time of requisitioning are eligible for reimbursement on the requisition.

- Energy funds are disbursed during or after construction work is completed.
- All requisitioned measures must be inspected and approved by the ECMO.
- The owner must use the Department's Energy Requisition Form to request funds.
- The owner must accurately and correctly complete the energy requisition form and submit it to the ECMO for review.
- Submit an electronic "pencil copy" (draft requisition) of the Energy Requisition to the ECMO at least three (3) days prior to the requisition inspection.
- The ECMO must inspect the installed measures and approve the requisition.
- The ECMO may require the Energy Requisition to be revised if the installed ECM's do not match the approved measures on Exhibit B of the Agreement and on the Energy Requisition form.

Retrofit Projects:

- Owners can determine the schedule for requisitions. The requisition schedule should be based on the installation of grouped portions of measures and/or timeframes.
- The Department processes retrofit payments.
  - 10% retention is held from each draw.
  - Retention is released after all work has been completed and approved.
- ECMO inspects installed measures that are requisitioned for payment.
- Required supporting documentation will include contractor invoices for all measures included on the requisition.
  - Measures on the contractor's invoice must be listed separately and correspond to the specific energy conservation measures on the Energy Requisition
  - Quantities of measures installed must match quantities listed on the Energy Requisition
  - Unspent funds cannot be re-allocated to other approved or non-approved measures.
- A final inspection will be performed by the ECMO when all work is completed.
- Post-completion diagnostic testing must be completed by a qualified energy auditor to quantify air leakage reduction and duct sealing (if applicable). Results must be submitted to the Department prior to the release of the final requisition payment or retention.

Pipeline Projects:

- The energy requisition form is supplemental to the CDA American Institute of Architects (AIA) G702/703 draw form.
- Energy funds are typically requisitioned on the same schedule as the CDA AIA draw.
- The AIA G702/703 is required as backup documentation for the energy requisition.
  - The EMO will retrieve the G702/703 from CDA Finance after it has been submitted and approved.
- Items requisitioned for payment must be fully installed (stored items do not qualify for payment with energy funds).
- Retention is not held from Energy funds in pipeline projects.
- Two copies of the energy requisition should be signed during the requisition meetings. One to be submitted with the construction draw to CDA Finance and one to be submitted to the ECMO.
- A final inspection is performed by the ECMO when all work is completed.
- Post-completion diagnostic testing must be completed by a qualified energy auditor to quantify air leakage reduction and duct sealing (if applicable). Results must be submitted to the Department prior to the release of the final requisition payment.

❖ Installed measures that do not match the approved measures on Exhibit B of the energy funding agreement and submitted cut sheets may result in a reduction or loss in funding.

❖ The Department may track energy use for up to two (2) years after project completion.

3. Owner/Applicant/Project Manager

Owners, Applicants, or Project Managers interested in receiving funding for energy conservation upgrades must follow the process outlined in this section. The different stages of this process include: application, application site visit, energy audit, developing the scope of work, full application, application review, funding determination, construction and requisitions.

❖Although the applicant or project manager may be different than the property owner, applicant and project manager will be referred to as "owner" in this document as it is assumed they will be operating on behalf of the property owner.

3.1. Application

Applications are submitted as an Application Package containing the documents required for application package review (required documents stated below). An application package is required only for retrofit projects; pipeline project application review is integrated with CDA's Rental Housing Finance application process. The application is received and reviewed by an EMO and an ECMO is assigned to the project once the application is determined to pass the review.

3.1.1. Retrofit Projects:

An application package[3] is submitted electronically by the applicant to MultifamilyEnergy.DHCD@Maryland.gov. The application package includes:

- Completed Multifamily Energy Efficiency and Housing Affordability Energy Funding Application;
  - All fields must be complete
- Proof of Affordability;
- Organization Documentation; and
  - A copy of all documents that identify the organization structure and owners/partners
- Copy of owner's commercial electric bill for the property.

3.1.2. Application Package Review

The Department reviews each application package for completeness and to determine property eligibility for funding based on the property's:

- Location;
- Utility provider;
- Utility meter structure;
- Affordability restrictions (Regulatory Agreements);
- Prior participation in energy programs (funding sources may have restrictions for how frequently a participant can participate in a given program. Example: EmPOWER only allows participation once every 5 years);
- Prior or future property rehabilitation; and
- Availability of funding.

[3] http://dhcd.maryland.gov/HousingDevelopment/Pages/EnergyEfficiencyWeatherization.aspx

The EMO will contact the applicant if further information is required. The EMO assigns eligible projects to an ECMO for an application site visit.

3.1.3. Pipeline Projects:

The energy application and review process is integrated with the Department's application and underwriting for other rental housing financing through the Department. A separate energy funding application is not required. In addition to items required under the Department's rental housing financing application, the owner must provide a copy of the project's commercial electric bill.

3.1.4. Pipeline Project Type:

The type of pipeline project may determine the amount of funding available.

Rehabilitation Projects:
Rehabilitation projects may be eligible for full measure funding based on economic analysis of measure cost effectiveness.

New Construction, Gut Rehabs, and Change of Use:
New Construction, Gut Rehabs, and Change of Use projects may be eligible for Incremental Investment Cost Funding only.

- Incremental Investment Cost Funding: The cost-effective portion of the incremental cost for high efficiency equipment exceeding base energy code.
  - High efficiency equipment typically comes at a higher cost but also uses less energy than base code equipment.
  - The incremental cost is the difference in cost between the high efficiency equipment and base code.
  - The cost-efficient portion of funding is determined by evaluating the reduced cost of the utility consumption achieved by the higher efficiency equipment as compared to the cost and utility consumption of base code equipment.
- The Incremental Investment Cost Funding worksheet must be completed for new construction, gut rehabs, or change of use building projects where energy funding is being considered.

3.1.5. Application Site Visit (Retrofit Projects Only)

An application site visit is conducted by an ECMO to determine if the project is potentially eligible for energy funding. The site visit will result in an application site visit report.

❖ Applicants for Pipeline projects may find an application site visit beneficial when considering requesting energy funds for their project. Pipeline project applicants may request an application site visit by contacting an EMO at the Department.

3.1.6. Application Site Visit Report

An application site visit report is provided to the owner by the ECMO. The report:

- Includes potential for energy funding;
- Provides a recommendation whether to continue with the application process or not;
- Includes a basic list of potential opportunities the energy auditor must consider, evaluate and include in their comprehensive list of improvements;
- Is intended to be reviewed by the auditor prior to the energy audit being performed; and
- If the report recommends moving forward with an energy audit, the owner should commission a qualified auditor to complete the comprehensive energy audit. The Department will not accept an energy audit from an Energy Auditor not found on the Department's Qualified Energy Auditor List.

3.1.7. Utility Consent Forms

Consent forms[4] are necessary to allow the program to acquire actual utility customer consumption data and enable the program to more accurately estimate project savings. Forms are not for property owner or management purposes.

- Property owner/applicant submits the forms to ECMO after:
  - Retrofit: receiving an application site visit report if the report from the Department that recommends moving forward with an energy audit
  - Pipeline: eligibility for energy funding has been determined by the Department
- Forms should be submitted to the ECMO prior to the on-site energy audit evaluation.
- Utility consent forms must be completed and signed by the:
  - tenant(s); and
  - owner, for owner utility information.

❖ The Department may track energy use for two (2) years after project completion.

3.2. Auditor Selection and Coordination of Energy Audit

Auditors must be chosen from the Qualified Auditor list found on the Department's website[5]. The audit activity should be coordinated with the residents/tenants to maximize the auditors' production during the on-site energy audit.

[4] Consent forms can be found at http://dhcd.maryland.gov/HousingDevelopment/Documents/Energy_Usage_Information.pdf

[5] Qualified Auditor List: http://dhcd.maryland.gov/HousingDevelopment/Documents/Qualified_Auditor_List.pdf

3.2.1. The auditor should request and be provided certain information to ensure their ability to accurately assess the existing conditions of the property; which may include:

- Maintenance logs and schedules;
- Appliance replacement history;
- Previous renovation history;
- Quick Home Energy Check-Up or other energy efficiency program upgrades previously installed;
- "Uncomfortable" areas in the building;
- History of frozen pipes, and locations; or
- Any other pertinent information the owner is aware of.

3.2.2. Sampling Protocol

The owner must notify tenants of the audit schedule to allow the auditor to enter the correct number and type of units determined by the auditor for sampling. See **Section 4.3.2** for more information on sampling protocol.

3.2.3. On-site Interviews

The auditor must have the opportunity to interview tenants during the on-site energy audit about their frequency of use of appliances and hours of operation for lighting. See **Section 4.4.1** for more information about the Energy Audit.

3.2.4. Energy Modeling

The auditor will input the information collected during the on-site energy audit into energy modeling software. The auditor will also enter actual energy usage information to calibrate the models savings with actual savings to ensure reasonable accuracy of the energy model. Energy usage information is obtained from submitted Tenant Utility Consent Forms and will be provided to the auditor by the Department in an anonymous format.

3.2.5. Energy Audit Report

The auditor will create a comprehensive energy audit report containing the qualitative and quantitative results of the energy audit and diagnostic testing as well as a list of recommended Energy Conservation Measures (ECMs). This report must be submitted to the EMO and ECMO assigned to the project.

3.3. Developing the Scope of Work and Request for Funding

The request for funding consists of two things: a comprehensive list of energy conservation measures and the associated costs for those measures. To develop the list of recommended energy conservation measures, the Design Team should work together to determine which measures are feasible and to get accurate costs for the auditor to perform the economic analysis. The request for funding is submitted to the Department for review.

3.3.1. The Design Team for retrofit projects typically consist of:

- Owner;
- Auditor;
- Contractor; and
- Engineer (occasionally).

3.3.2. The Design Team for pipeline projects typically consist of:

- Owner;
- Auditor;
- Architect;
- Engineer; and
- Contractor.

3.3.3. Contractors

The owner will commission a contractor for the installation of the identified recommended energy efficiency measures.

- Bid proposal costs from the chosen contractor are to be used by the auditor to perform economic analysis and determine each measure's Savings to Investment Ratio (SIR).

3.3.4. Design Team Communication

For both pipeline and retrofit projects, the Design Team must include the auditor in conversations about the design of the project. Failing to do so will typically result in design flaws requiring changes to the scope of work that can impact the project construction schedule and budget.

3.3.5. Measures Not Funded by Energy Program

Proposed measures must not conflict with other proposed measures, existing equipment or structures in terms of space constraints and differences in technologies. For example, pin-based lamps must be proposed for pin-based light fixtures, R410a central air conditioners must not be proposed to replace a R22 air conditioner without replacing other compatible equipment, and so forth.

3.3.6. Auditor

The owner and auditor will collaborate to determine the final proposed scope of work for the energy efficiency upgrades. Using costs from the contractor bid, auditors will determine the SIR for:

- Each measure; and
- The cumulative package of measures for the project.

3.3.7. ECM Data Sheet and Audit Report

The ECM Data Sheet and Audit Report created by the auditor must be submitted to the Department for review. The ECM data sheet is used as the "funding request". It includes the scope of work and actual costs of the measures. The audit report will contain all back-up data needed to support the ECMs listed in the data sheet.

3.3.8. Economic Analysis

The auditor will use actual costs from the contractor to perform economic analysis. Owner and auditor shall review the package of measures and appropriately adjust the MEEHA funding amounts to meet program requirements. Economic analysis is performed using the ECM data sheet. After economic analysis has been performed, the adjusted ECM data sheet will be submitted to the ECMO as the funding request. Program requirements for the funding request are:

- The package of measures must have a cumulative SIR of 1.1 or better.
- Measures with a SIR less than 1.1 may be fully funded if other measures have an SIR above 1.1 and the cumulative project SIR is above 1.1.
- In cases where the cumulative project SIR is below 1.1, measures with a SIR less than 1.1 may be eligible for partial funding if:
  - The ECM will provide significant energy savings
  - The ECM has a health and safety as well as energy conservation component
  - The ECM is shown to be an integral part of a system that will produce significant energy savings

❖ Owners are responsible for any cost above the funded portion of the partially funded measure.

❖ Quantities of measures may not be reduced to meet SIR requirements.

❖ Depending on the funding source, some measures might not be eligible.

3.4. Full Application

An application is considered "full" when all necessary documentation is received by the Department and underwriting and legal reviews can begin. The following is required to be submitted for each full application:

3.4.1. Retrofit:

- Completed Application;
- Energy Audit including funding request (ECM data sheet);
- Proof of affordability ;
- Organizational Documents (for all entities);
- Copy of commercial electric bill(s);
- Credit report
  - Must be less than 365 days old;
- The Department's MBE Form;
- Resolutions and Incumbency Certificate (authorized to enter into the Grant Agreement on the terms & conditions required by the Department);
- Signed Certificate of Good Standing
  - Must be less than 30- days old; and
- Signed Owner/Commercial Space Utility Consent Form.

In addition to the application documents, several documents are required prior to the start of construction. These documents can be submitted any time (as a package of documents) prior to construction but are not required prior to the execution of the grant or loan. The construction documents include:

- W9 Tax ID form;
- Contractor Licenses for each contractor;
- Permits or signed statement that permits are not required for the Energy Program funded work;
- Liability Insurance;
- Property Insurance; and
- Product Specification Sheets for all program funded products to be installed.

❖ The Application Form and other helpful documentation can be found on the Department's website.[6]

3.4.2. Pipeline:

The application review process is integrated with the Department's "Form 202" application and underwriting for CDA rental housing financing. The required documents are submitted in accordance with the underwriting schedule set by the rental housing financing project underwriter. In addition to items required by rental housing financing, the owner must provide the program with:

- Copy of commercial electric bill for the project;
- Completed and executed Owner/Commercial Space Utility Consent Form;
- Completed and executed Tenant Utility Consent Forms; and
- The approved measures and associated energy funding must be clearly identified in CDA Form 215 (sample shown below).

Description of Work		*Estimated Units (Quantity)*	*Estimated Cost (Material and Labor)*		
Code	*Item*		*Per Unit*	*Unit*	*Total*
071-00	**Total Waterproofing**				$ 40,715.00
071-01	Caulking and Sealant	1.0	$ 20,275.00	lump sum	$ 20,275.00
071-02	EmPower Funding for Air Sealing Units - Wall penetrations including electrical outlets, floor to wall intersections and plumbing items	56.0	$ 365.00	per unit	$ 20,440.00

3.5. Funding Determination

The Department will review, adjust, approve, deny, and/or request more information for each measure in the proposed scope of work and its associated funding amount based on the eligibility of measures per the funding source.

- Final funding amounts are discussed with the owner once the Department has determined eligible measures and funding amounts.
- Projects often require cost-sharing of some measures to make the package of measures economically feasible.
- Upon owner acceptance of the Department's funding determination, a reservation letter is issued.

[6] The Department's Website:
http://dhcd.maryland.gov/HousingDevelopment/Pages/EnergyEfficiencyWeatherization.aspx

3.5.1. Cost-Sharing

Cost-sharing is the partial funding of one or more measures within a package of measures. The Department will only fund the cost-efficient portion of the package of measures, which in many cases, is not the full cost of the measures. Therefore, a portion of the cost will be incurred by the owner.

3.6. Closing Process

The term "closing process" refers to the process of executing the grant or loan documents and begins with the reservation of funds. The initial funding amount reserved is based on initial documentation and the energy audit review results. The reservation notice is issued, signed, and returned to the Department. The Department's underwriting team reviews all documents, as does the Office of the Attorney General, and upon approval, a proposed loan/grant Agreement will be issued. The project is considered "closed" when all parties have signed the grant or loan Agreement. The project can then move to the construction phase.

3.6.1. Reservation of Funds

The reservation of funds is a notice to the applicant that funds are reserved for the project, contingent on underwriting and legal reviews.

- Reservation notice issued (awardee has 10 business days to sign and return reservation notice)
  - Funding amounts are reserved for 30 days post-reservation during which time the owner provides all remaining required documentation required to issue the Grant Agreement.

❖ The receipt of a reservation notice does not guarantee funds. The reservation notice places the project in reservation status and project funding will be approved on a first- ready (required documents submitted), first-served basis for those projects in reservation status.

3.7. Underwriting and Legal Review

All application documentation is subject to review by the EMO assigned to the project and the Office of the Attorney General.

Required documents for Retrofit Projects:

- Organizational documents including bylaws and partnership agreements for all entities including the owner of the property, awardee (if different), and managing members;
- Regulatory agreement;
- Signed resolutions and incumbency certificate;
- Certificate of good standing (signed and submitted within 30 days of executed grant agreement);
- SDAT Real Property Search to confirm address;
- Historic Review; and
- W9 Tax ID form.

Pipeline Projects: energy funding underwriting and legal review is integrated with the Department's application underwriting and legal review for rental housing financing.

3.8. The Agreement

After the legal review, the Office of the Attorney General will create the appropriate loan or grant agreement. The proposed agreement will be circulated for signature among all parties and returned to the Department. Once the Department receives the signed Agreement, the project is considered "closed".

Additional documents are required to be submitted to the Department after the Agreement has been signed and prior to the beginning of construction for Retrofit projects, including:

- Contractor Licenses for each contractor;
- Permits or signed statement that permits are not required;
- Liability Insurance; and
- Property Insurance.

3.9. Construction

Work should begin on the property after an Agreement is fully executed. Any work started before an executed Agreement is in place may not receive funding.

- The EMCO must be notified of the construction start date.
- The ECMO must be notified of all progress and requisition meetings.
- Product specification sheets must be submitted and approved by the ECMO before measures are installed.
    - Product specification sheets are reviewed to confirm measures to be installed match the efficiency of funded measures.

3.10. Requisitioning for Funds

A requisition is the official claim for reimbursement of completed work. Funds are only disbursed on a reimbursement basis for installed work. Owners request funds by completing and submitting an energy requisition to the ECMO. A complete and accurate requisition documenting the proper use of funds and supporting documentation will ensure a more timely requisition payment. Energy Requisition Forms are created and supplied by the ECMO after the loan/grant agreement has been executed.

3.10.1. Proper use and application of funds

- Funds can only be used for the measures identified in the Exhibit B of the loan or grant agreement. Installed appliances, equipment, and materials must be no less efficient than the efficiencies identified in the Exhibit B.
    - Installed measures that are not at least as efficient as those approved in the Exhibit B may have the funding reduced or revoked for that measure.
- Unexpended funds cannot be used for activities not identified in Exhibit B.

3.10.2. Requisitions

- Energy funds will be disbursed during the course of construction as work is completed.
- The owner must use the Department's Energy Requisition Form to request funds.
- The owner must completely and accurately fill out the energy requisition form and submit it to the ECMO for review.
- An electronic "pencil copy" (draft requisition) of the energy requisition must be submitted to the ECMO at least three (3) days prior to the requisition inspection.
- All requisitioned measures must be inspected and approved by the ECMO.
- The ECMO may request the requisition to be revised if the installed ECM's do not match the approved measures on Exhibit B of the Agreement and on the requisition form.

Retrofit Projects:

- Owners will determine the schedule for requisitions. The requisition schedule should be based on the installation of grouped portions of measures and/or timeframes.
- The Energy Programs process retrofit payments.
  - 10% retention is held from each draw.
  - Retention is released upon final inspection and approval after all work has been satisfactorily completed.

Pipeline Projects:

- The energy requisition form is supplementary to the rental housing financing draw (AIA G702/703).
- Energy funds are typically requisitioned on the same schedule as the CDA draw.
- Expenses on the energy requisition form must match the requested energy expenses on the AIA G702/703 form for each draw.
- Items requisitioned for payment must be installed (stored items can't be paid with energy funds).
- Retention is not held from Energy funds.
- Multifamily Finance processes pipeline payments.

❖ Installed measures that do not match the approved measures on Exhibit B of the agreement and submitted product specification sheets may result in a reduction or loss of funding.

3.11. Completion of Construction

Upon completion of construction, the final requisition is submitted to the ECMO. Prior to signing the final requisition, the following must be completed:

- Quality assurance visual inspection and diagnostic testing must be performed by a qualified energy auditor to determine if the installed ECMs will achieve their intended results.
    - A visual quality assurance inspection must take place to determine if all duct and air sealing opportunities stated in the energy audit report were installed properly and effectively. This inspection may occur during or after construction.
    - Blower door test - A sample of units must be tested to quantify air leakage reduction after the air sealing scope of work has been completed and the visual quality assurance inspection has taken place.
    - Duct diagnostic test - If duct sealing was included in the scope of work, duct diagnostic testing must be performed on a sample of units to quantify duct leakage results after the duct sealing scope of work has been completed and the visual quality assurance inspection has taken place.
    - The sample of units is determined based on guidelines found in **Section 4.3.2**
- A report must be created by the energy auditor identifying the results of quality assurance inspections and post construction diagnostic testing. The report must be submitted to the Department with the final energy requisition.

❖ Upon approval, the Department will release the final requisition including retention held on retrofit projects.

3.12. Maintenance Schedules and Logs

Proper maintenance of the installed ECMs is necessary for them to operate in the most efficient manner and achieve expected results.

- Auditors, in coordination with the contractors, should make recommendations for operations and maintenance policies on the installed measures creating an operations and maintenance manual specific to the project.
- Maintenance activities should be recorded and logged. Property staff can refer to the maintenance log to determine future maintenance and plan for future replacement.

4. Energy Auditor

The Qualified Energy Auditor is the individual responsible for managing the multifamily energy audit and responsible for the review and release of the final audit report. Energy Auditors must perform energy audits in accordance with current BPI Standards and Protocols and guidance stated in the Auditor Qualification Form utilizing the "building as a system" approach. The energy auditor must be able to examine, understand, and recommend a comprehensive list of energy conservation measure (ECM) improvements that will maximize the energy efficiency of the property based on the economic analysis of all feasible energy conservation opportunities. The auditor will perform the audit, enter the existing information into an energy model, and create a list of ECMs to be considered. From that list, the auditor discusses with the Owner the ECMs to recommend and propose to the Department for energy funding.

4.1. Qualified Energy Auditor

Energy Auditors performing energy audit work for the Department's multifamily projects do not contract with the Department but must be qualified by the Department. Auditors contract directly with building owners or developers and are hired to perform or produce the required on-site evaluation, building energy modeling, audit report and ECM data sheet, and as well as quality assurance inspections. To be included on the Qualified Auditor List, auditors must submit to the Department:

- An executed Auditor Qualification form;
- Three (3) sample reports demonstrating knowledge of building construction and building science;
- A copy of the auditor's Building Performance Institute's Multifamily Building Analyst certification; and
- One (1) other building science certification.

4.2. Auditor Responsibilities

Key responsibilities of the qualified auditor include:

- Coordinating the energy audit;
- Providing unbiased and accurate ECM recommendations;
- Making appropriate adjustments to the audit team when a project exceeds the auditor's capabilities;
- Meeting all qualifications indicated in the Auditor Qualification Form;
- Adhering to the Department's multifamily audit requirements;
- Adhering to current BPI Technical Standards for the Multifamily Building Analyst Professional[7];
- Signing the final report signifying their responsibility for the information presented within.

[7] Link to BPI's Multifamily Building Analyst Professional Technical Standards: http://www.bpi.org/sites/default/files/BPI-1105-S-201x%20Standard%20for%20Multifamily%20Energy%20Auditing%20-%2010-15-13.pdf

4.3. Pre-Energy Audit Activities

Some data will be able to be collected prior to the energy audit.
Preliminary data collection should include, but not be limited to, the following:

- Contact information of all parties involved in the project (including contractors, architects, engineers, etc.);
- Building blueprints or as-built drawings;
- Maintenance logs/appliance replacement history;
- Application site visit report;
- Basic information about the building including:
  - Square footage of project
  - Number of units
  - Various unit layouts and number of each
  - Number of bedrooms per unit
  - Number of buildings
  - Square footage of building(s)
  - Number of stories per building
  - Elevator(s)
  - Any other information needed to determine the correct sample size.

4.3.1. Tenant Utility Consent Forms

Tenant utility consent forms are sent to owners after funding potential has been determined. Owner shall disseminate utility consent forms to 100% of residents and collect completed and signed forms to return to the Department. Consent forms should be submitted prior to the on-site evaluation. The Department uses these forms to retrieve actual utility usage to be provided to the qualified auditor for accurate energy savings calculations. If the owner has not timely completed this task, the auditor should assist the owner in obtaining completed Tenant Utility Consent Forms and submit them to the Department.

4.3.2. Sampling Protocol

Prior to conducting the energy audit, a determination must be made about which units will be inspected. The number and type of units inspected will be determined by the following protocol:

- Sampling will include a cross section of units within the project.
- The audit shall be completed on at least 10% of each unit type within the building or a minimum of 5 units if the project has less than 50 units.
- Units which are part of the audit sample must undergo a uniform scope of inspections and diagnostic testing.
- Quantities and descriptions of ECMs in sampled units should be used to reasonably extrapolate the actual quantities and ECMs for the project as a whole. For example, a complex has 100 apartments with the same configuration: half of the apartments sampled have (2) T-12 40 watt tubes in the kitchen and the other half have single lamp 100 watt incandescent bulbs. Based on the sampled units, the kitchen area lighting for the project would be modeled with (100) T-12 40 watt tubes and (50) 100 watt incandescent bulbs.

❖ If results are inconclusive, additional units must be sampled.

4.4. Energy Audit:

Key objectives for the energy audit include but are not limited to:

- Observe and document existing conditions affecting the building's energy use, including inherent building construction deficiencies causing energy inefficiencies;
- Perform diagnostic testing to accurately quantify the existing air and duct leakage and determine potential combustion safety issues;
- Identify all feasible ECMs using the results of the diagnostic testing and other observable opportunities;
- Identify potential water conservation measures;
- Assess the need for ventilation or moisture management; and
- Document observed safety and health concerns found during the course of conducting the energy audit.

❖ Where this Program Guide and BPI Technical Standards conflict, the Department's Program Guide takes precedence, but the Department's Program Guide does not take precedence over state and/or local building code.

4.4.1. Surveys/Interviews

Interviewing property staff and tenants can often uncover building and system deficiencies when the appropriate questions are asked.

4.4.1.1. Auditors must conduct interviews with:

- Property staff regarding
  - Operational issues with building systems;
  - The presence of hazardous materials in the building (e.g. asbestos, mold);
  - Comfort issues (e.g. hot or cold spaces);
  - History of freezing pipes;
  - Hot water supply issues;
  - Indoor air quality (IAQ) concerns;
  - Combustion safety issues;
  - Maintenance protocols; and
  - Interior and exterior lighting schedules.
- A cross-section of building tenants regarding
  - Energy use levels;
  - Indoor air quality;
  - Dishwasher loads;
  - HVAC control settings;
  - Comfort in each room/season;
  - Migrating odors;
  - Condensation or fog on windows or mirrors; and
  - Hours of lighting use for each type of light or room.

4.4.2. Diagnostic Testing

Required diagnostic testing includes:

- Combustion Safety;
- Blower Door;
- Duct Leakage
  - Only required if located in unconditioned or exterior spaces (See **Section 4.4.2.3**);
- Mechanical Ventilation testing.

4.4.2.1. Combustion Safety

All combustion safety tests must be performed per BPI Multifamily Analyst Professional and BPI Building Analyst Professional protocols. Failures of combustion safety testing and fuel leak detection must follow BPI Multifamily and Building Analyst Professional protocols.

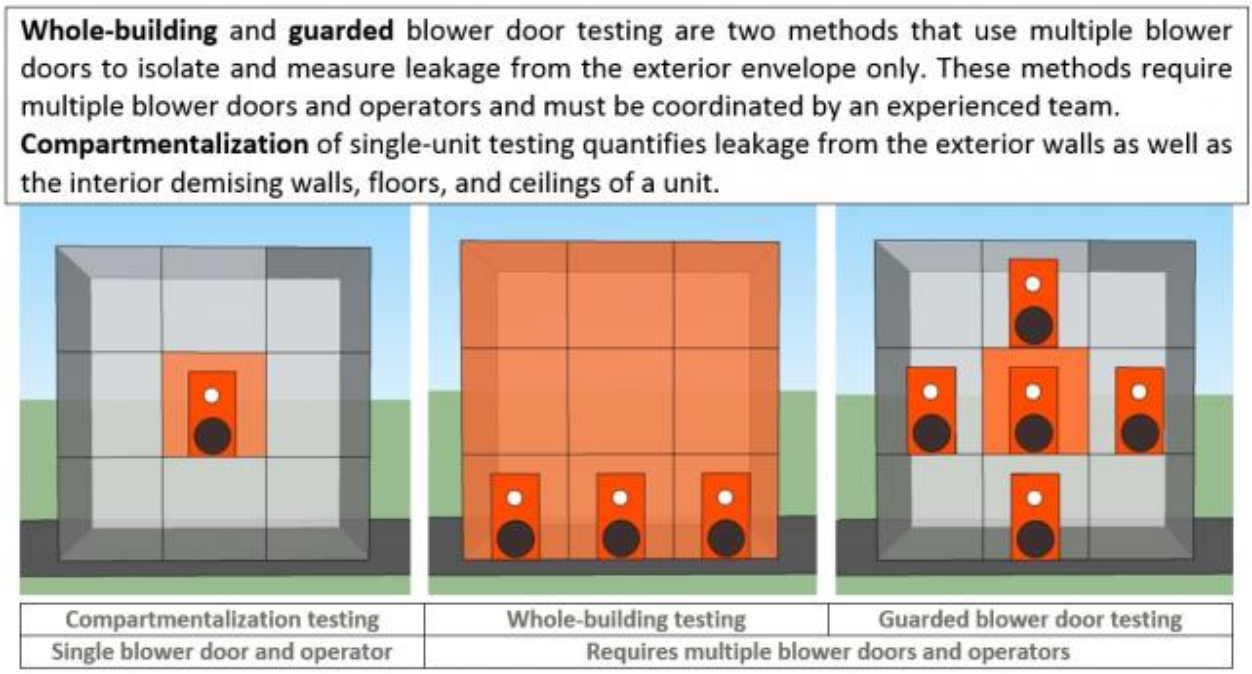
- Carbon Monoxide (CO) and efficiency testing results must be included in the audit report.
- Venting configurations must be described in the audit report.
- Failures of combustion safety testing and fuel leak detection must follow BPI Multifamily and Building Analyst Professional protocols.

❖ Failures must be reported to the property owners immediately.

4.4.2.2. Blower Door Testing

Three types of blower door testing are available for measuring air leakage of a multifamily building:

1. Un-guarded;
2. Whole Building; and
3. Guarded (compartmentalization).



Sean Maxwell, May 12, 2016 Green Building Advisor[8]

❖ Type of testing performed must be stated in the audit report.

4.4.2.3. Duct Diagnostic Testing

The auditor must determine the following for the existing conditions of duct systems in exterior or unconditioned spaces:

- Location;
- Diameter or size of duct(s);
- Estimated length of duct for each size;
- R-value and thickness of insulation; and
- Duct air leakage
  - Ducts located outside the building envelope (exterior wall cavities, attics or vented crawlspaces) must be tested using appropriate diagnostic testing equipment.
  - A visual assessment may be used to determine duct leakage for ducts located 100% within interior spaces.

4.4.2.4. Mechanical Ventilation

Mechanical ventilation must be tested including:

- Bath fans
- Range hood fans

[8] http://www.greenbuildingadvisor.com/sites/default/files/images/Maxwell%20-%20Illustration%203.preview.png

4.4.3. Space Heating and Cooling Systems

Tenant and common area space heating and cooling systems must be inspected. The auditor must determine and identify the following for each system:

- Type;
- Age;
- Size;
- Efficiency;
- Location (inside or outside building envelope);
- Fuel source (gas, electric or oil);
- Venting type (if combustion appliance);
- Distribution system (ducted, hydronic or none); and
- Thermostatic controls.

4.4.4. Domestic Hot Water (DHW) Systems

The auditor must determine and identify:

- Type;
- Age;
- Size;
- Efficiency;
- Location (inside or outside building envelope);
- Fuel source (gas, electric or oil);
- Venting type (if gas);
- Distribution pumps (variable speed or non-variable speed); and
- Temperature of water at faucets.

❖ Flow rates for kitchen and bath aerators and showerheads must be tested.

4.4.5. Appliances

The following appliances must be inspected:

- Refrigerator;
- Clothes washer;
- Clothes dryer; and
- Dishwasher.

4.4.5.1. For each Appliance, the auditor must determine and identify:

- Type;
- Age;
- Size;
- Efficiency; and
- Fuel source (gas or electric).

4.4.6. Fenestration

The auditor must inspect exterior windows and doors.

4.4.6.1. Windows - the auditor must determine and identify:

- Quantity;
- Size(s);
- U value; and
- Solar Heat Gain Coefficient (SHGC).

4.4.6.2. Doors - the auditor must determine and identify:

- Quantity;
- R-value; and
- Size(s).

❖ Glass doors are considered windows for building energy modeling purposes.

4.4.7. For each of these sections of the building envelope:

- Walls
- Floor/foundation
- Attic/roof
  - The auditor must determine and identify:
    - Type of assembly;
    - R-value of insulation
    - Type of insulation

4.5. Building Energy Modeling

Acceptable energy modeling software programs include eQUEST, EA-Quip, REM Rate, and TREAT for multifamily buildings.

4.5.1. Baseline building energy models must include:

- Input of actual existing conditions found during the energy audit.
- Model variations for each major type of floor plan, (e.g. a model for 3 bedroom units; a model for 2 bedroom units), when different residential units are found
- All feasible energy conservation measures for consideration to determine their energy savings. This means the audit report must list all energy efficiency opportunities that could be performed regardless of economic analysis. The economic analysis will determine what is recommended from the list.

❖ The Department will provide utility history to the auditor when available. The auditor must use the actual utility usage for building energy modeling.

4.5.2. Calibrating the Building Energy Model

Building energy models must be calibrated to within +/- 10% of actual utility consumption. Calibrating the building energy model to accurately describe the existing conditions involves adjusting the software model in reasonable ways, such that the modeled energy total estimates better align with actual historical totals.

- The model can be adjusted in the following ways and should be done as intended by the software developer:
  - Efficiency of HVAC systems based on age, condition, and usage
  - Efficiency of water heating systems based on age, condition, and usage
  - Appropriately adjusting the hours of use for lighting
  - Adjust temperature settings for heating and cooling
  - Adjust other unknown conditions

4.5.2.1. General guidelines for baseline model calibration include:

- Baseline model adjustments must not contradict confirmed field observations or data.
- The building energy model and the utility bill history must both be based on the same annual energy consumption period.

4.5.3. The auditor should use the building energy model to generate a list of all feasible measures that have energy savings.

- This list will become the "Considered ECMs List".

4.6. Audit Report

The audit report identifies audit findings, results of diagnostic testing, recommended ECMs and considered ECMs.

- A draft audit report is used to communicate to the owner and design team which ECMs are being considered.
- A final draft of the audit report is submitted to the Department and must be signed and dated by the qualified auditor.

4.6.1. The following is a recommended outline for an audit report:

- Executive Summary
  - Names and contact information of audit team
  - Contact information for owners, contractors and architect/engineer (if applicable)
  - Description of buildings and site, including:
    - Number of buildings
    - Age
    - Construction type
    - Foundation type
    - Roof/attic type
    - Type of units (efficiency, 1 bed, 2 bed, etc.)

        - Number of units
        - Number of floors
        - Number and type of elevators
        - Square feet of tenant space
        - Square feet of Common space
    - Utility information
        - Utility Supplier(s)
        - Utility Meter structure:
            - Individual metered
            - Master-metered
            - Mixed-metered
            - Individually metered by a third party
        - Annual usage for:
            - Gas
            - Electric
            - Water
            - other
        - Projected energy reduction per energy type (kWh/therm)
    - Safety concerns/hazards identified
    - Failed combustion safety testing results
    - Assumptions made during the audit process and how building components which cannot be physically verified were addressed
- Existing Conditions
    - Diagnostic Testing Table
    - HVAC Table
    - Lighting Systems Table
    - Window Table
    - Building Envelope and R-values (foundation, walls, attics, roof)
    - Appliances
        - Refrigerators/freezers
        - Domestic Hot Water
        - Clothes Washer and Dryer
        - Dishwasher
    - Energy Generation and Advanced Technologies
    - Recent (within 3-years) upgrades from Utility programs such as Quick Home Energy Check-up (QHEC)
- ECM Data Sheets
    - Recommended ECMs list
    - Considered ECMs list
- Supporting Information
    - Descriptions of ECMs
    - Existing condition pictures of each recommended ECM
    - Air sealing scope of work
    - Building Energy Model reports

4.6.2. Audit Report Criteria

4.6.2.1. Reporting Diagnostic Results

- The Energy Audit Report must include the "Diagnostic Test Results Table"
  - Enter all diagnostic results in this table.
  - All testing categories must be filled out for each unit sampled.
- If a unit could not be tested, the reason must be stated directly following the Diagnostic Test Results Table.

Diagnostic Test Results Table Example:

Unit Number	Number of Bedrooms	Air Leakage Testing Results (CFM50)	Duct Leakage Testing Results (CFM25)	Kitchen Exhaust (CFM)	Bathroom Exhaust (CFM)
103	1	553	80	62	20
210	3	710	122	94	12
415	2	645	44	58	35

4.6.2.2. Space heating and cooling system information needed:

- Ownership
- Location
- Type
- Size
- Quantity
- Efficiency
- Age

HVAC Table Example:

Ownership	Location	Type	Size	Quantity	Equipment manufacturer Efficiency	De-rated efficiency	Age
Tenant	Interior	Split System Heat Pump	1.5 Ton	132	8 SEER, 6 HSPF	7 SEER, 5.5 HSPF	1995
Tenant	Interior	Split System Heat Pump	1.5 Ton	18	12 SEER, 6.7 HSPF	10 SEER, 6.1 HSPF	2004
Owner	Rooftop	Split System Furnace and Air Conditioner	120,000 BTU, 5 Ton	3	79 AFUE, 8 SEER	76 AFUE, 7 SEER	1995

4.6.2.3. Efficiency ratings for HVAC systems:

- Heat pump split system – HSPF and SEER
- Heat pump mini split – HSPF and SEER
- PTAC – EER or COP
- PTHP – EER or COP
- Furnace and boiler – AFUE
- AC split system – SEER
- Window AC units - EER
- Electric resistance heaters: COP

❖ Efficiency ratings must be degraded based on age, condition, and usage. Factors to determine efficiency rating must be stated in the audit report.

4.6.2.4. Distribution systems

HVAC distribution system type must be stated in the audit report. Diagnostic testing on distribution systems must be stated in the diagnostic testing results table.

- Hydronic:
  - Insulation R-value
  - Insulation thickness
  - Constant speed vs. variable speed pump
  - Bypass valves on tenant air handling or radiator units
- Ducted:
  - Interior
    - Visual inspection of duct leakage
  - Exterior
    - Duct blaster CFM25 results
    - Insulation R-value
    - Insulation thickness

❖ If ducting systems could not be tested at the time of the audit, auditors must use BPI's Distribution Efficiency Look-Up Table to determine duct leakage.[9]

4.6.2.5. Lighting

Existing lighting data must be provided as indicated in the sample Lighting Table below.

- Lamps with different ownership groups, lamp type, watts, and hours of use must be identified separately.

[9] http://www.bpi.org/files/pdf/DistributionEfficiencyTable-BlueSheet.pdf

4.6.2.6. Lighting information needed:

- Ownership (Tenant/Owner)
- Lamp type
- Location
- Quantity (bulbs)
- Efficiency (Watts)
- Hours of Use per Day

Lighting Table Example:

Ownership	Lamp type	Location	Quantity	Efficiency (Wattage)	Hours of Use per day
Owner Interior	4' T-8	Hallways	212	32	24
Owner Exterior	Wall Packs	Exterior of Building	17	150	12
Owner Interior	2' T-8	Office	30	17	14
Tenant	CFL Type A	Kitchen Ceiling	244	23	4.5
Tenant	Incandescent Type A	Kitchen Range Hood	122	40	1
Tenant	Incandescent Globe	Bathroom	366	40	2.5

❖ Hours of use should be determined from resident interviews. If "hours of use" is not able to be determined during client interviews, the most recent version of the Mid-Atlantic Technical Resource Manual may be used for that lamp type.

4.6.2.7. Windows and doors

The following counts and identification are required separately for windows and doors:

- All common area windows
- All tenant windows
- All common area exterior doors
- All tenant exterior doors

4.6.2.8. Window information needed:

- Quantity
- U-value
- SHGC
- Framing material

4.6.2.9. Door information needed:

- Quantity
- Door material
- R-value

Window and Door Table Example

Ownership	Quantity	Framing or Door Material	Number of Panes	SHGC	U-value / R-value
Tenant Windows	152	Aluminum	1	.70	.56
Common Area Windows	36	Aluminum	2	.35	.32
Common Area Glass Door	3	Aluminum	1	.70	.56
Tenant Exterior Door	38	Solid Wood	NA	NA	4
Common Area Exterior Door	2	Vinyl	NA	NA	2

❖ Efficiencies of windows and doors should be determined by specifications from building drawings or manufacturer model numbers if available. If not available, the report must indicate how the efficiency value was determined.

4.6.2.10. Building envelope and thermal boundary information needed for attic/roof, walls, and foundation:

- Type of attic/roof (pitched/flat)
- Wall construction type and material
- Foundation type and material
  - Wall height from foundation floor to foundation ceiling
  - Exposure above grade
- Insulation type(s), amount(s), and R-value.
- R-value of insulation
  - Original
  - Degraded

4.6.2.11. Refrigerators:

- Age
- kWh/yr

4.6.2.12. Water Heaters:

- Age
- Efficiency
- Heating source (gas or electric)

4.6.2.13. Water savers (Showerheads, bathroom and kitchen aerators):

- Flow rate as measured (GPM)

4.6.2.14. Water closets:

- Gallon per flush

4.6.2.15. Exterior venting bath and kitchen fans:

- Age
- CFM flow rate
- CFM/Watt
- Terminates to exterior of building, in attic, or other interstitial space

4.6.2.16. Elevators:

- Type (drive system)
- Controls
- Motor

4.6.2.17. Dishwashers:

- Efficiency rating
- Gallon per load
- Annual electric consumption

4.6.2.18. Laundry equipment (Washers and Dryers):

- Load count per year
- Efficiency rating
- Gas or electric
- Gallon per load

4.6.2.19. Circulation/Pool pumps:

- Variable speed or single speed
- Horsepower
- Seasonal or annual operation

4.6.2.20. Energy Generation and Advanced Technologies

The potential for energy generation equipment such as solar PV panels should be considered at each property. Advanced technologies such as solar hot water heaters should also be considered.

4.6.3. ECM Data Sheets

Auditors must use the ECM data sheet to identify the recommended and considered ECMs. ECM data sheets must also be used to create the Recommended and Considered ECMs Lists.

4.6.3.1. Recommended ECMs List

The Recommended ECMs List should consist of all energy conservation measures being recommended for funding.

4.6.3.2. Considered ECMs list

The Considered ECMs List should consist of all energy conservation measures considered but not recommended for funding.

❖ Lighting ECMs must state wattage rating and hours of use in specifications column.

4.6.4. Supporting Information for ECMs

4.6.4.1. Descriptions of ECMs

All recommended and considered ECMs must have a short narrative in the audit report explaining:

- The existing condition including efficiency specifications;
- The efficient condition including efficiency specifications; and
- Other considered efficient options for the ECM (if any).

The narrative should be clear and sufficiently detailed so a contractor can accurately bid the work and then efficiently carry it out. Specific types, models, and sizes of equipment should be specified.

4.6.4.2. Existing Condition Pictures

A picture of the existing condition must accompany each recommended ECM narrative in the audit report.

4.6.4.3. Air Sealing Scope of Work

- An air sealing ECM must be considered for every project
- Each audit report must contain a list of locations to be included in the air sealing scope of work
  - The estimated reduction in air leakage must be based off of the locations stated in this list
  - Air leakage reduction estimates must be determined on a project by project basis according to the stated scope of work
- Auditors must consider whole building envelope air sealing as well as unit compartmentalization when defining the air sealing scope of work for each project

4.6.4.4. Building Energy Model reports

Upon request a copy of a report generated from the building energy modeling software will be provided to the Department by the energy auditor.

4.6.4.5. Calculations completed outside of building energy model

If energy savings are calculated for any ECM outside of the building modeling software, the reason must be stated and all calculations must be set out in the audit report.

4.6.5. Operations and Maintenance

The auditor must include a list of "Operations & Maintenance (O&M) Recommendations" specific to the project, in the Audit Report.

- The auditor should work with the contractor to develop these recommendations specific to the ECMs being installed.

4.6.5.1. Recommendations should include the following types of information for specific systems/ECMs:

- Critical maintenance tasks to ensure performance (e.g. cleaning the filter on an energy/heat recovery ventilator);
- Important resident responsibilities (e.g. thermostat set points);
- Annual maintenance milestones (e.g. exterior light controls); and
- Proactive maintenance items that prolong the effective useful life vs. reactive repair.

4.6.6. Audit Report Submission and Review

The auditor submits the completed audit report (including request for funding) to the owner who then submits the report to the Department.

- The Department will review the audit report and determine final funding amounts.
- The Department may require additional information to determine funding.
  - The auditor must be able to modify reports and energy models to satisfy requirements needed to make a determination.
  - This may require additional information from the owner, an additional site visit, or other necessary actions.

4.7. Developing the Request for Funding

The request for funding consists of two parts: 1) a comprehensive list of energy conservation measures and, 2) the associated costs and proposed funding amounts for those measures.

To develop the list of recommended energy conservation measures, the Design Team should work together to determine which measures are feasible and to get accurate costs for the auditor to perform the economic analysis. The auditor will then create the request for funding which is submitted to the Department for review by the owner.

4.7.1. The Design Team for retrofit projects typically consists of:

- Owner;
- Auditor;
- Contractor; and
- Engineer (occasionally).

4.7.2. The Design Team for pipeline projects typically consists of:

- Owner;
- Auditor;
- Architect; and
- Engineer.
- Contractor

4.7.3. Contractor

The owner will solicit bids for the installation of the recommended energy efficiency measures.

- Bid proposal costs from the chosen contractor are to be used by the auditor to perform economic analysis and determine each measure's Savings to Investment Ratio (SIR).

4.7.4. Design Team Communication

The Design Team must include the auditor in conversations about the design of the project for all projects. Failing to do so will typically result in design flaws requiring changes to the scope of work that can impact the project construction schedule and budget.

4.7.5. Measures Not Funded by Energy Program

Proposed measures must not conflict with other proposed measures, existing equipment or structures in terms of space constraints and differences in technologies. For example, pin-based lamps must be proposed for pin-based light fixtures, R410a central air conditioners must not be proposed to replace a R22 air conditioner without replacing other compatible equipment, etc.

4.7.6. Auditor

The owner and auditor will collaborate to determine the request for funding for the energy efficiency upgrades. Using costs from the contractor bid, auditors will determine the SIR for:

- Each measure; and
- The cumulative package of measures for the project.

4.7.7. Economic Analysis

The request for funding is developed based on the economic analysis of each measure and cumulative project. An auditor must analyze each measure's energy savings as well as implementation cost to determine the measure's feasibility. The auditor uses actual costs from the contractor to perform the economic analysis. The Owner and auditor shall review the package of measures and appropriately adjust the MEEHA funding amounts to meet program requirements. Some ECMs may be eligible for full funding, though this may not be practical due to the investment cost of the ECM. These ECMs may be eligible for cost-sharing between the Owner and the Department. After economic analysis has been performed, the adjusted ECM data sheet is submitted to the ECMO as the request for funding. Program requirements for the request for funding are:

- Economic analysis is completed using an ECM Data Sheet.
- Each measure listed on the Data Sheet is analyzed for its economic and energy impact.
- The ECM data sheet is used as the request for funding and submitted to the Department by the owner.
- The package of measures (Residential/Tenant and Commercial/Owner) must have a cumulative SIR of 1.1 or better.
- Measures with a SIR under 1.1 may still be eligible for funding if other measures have an SIR with adequate savings above 1.1 and the cumulative SIR is above 1.1.
- In cases where the cumulative SIR is below 1.1, measures with a SIR under 1.1 may be eligible for partial funding if:
  - The ECM will provide significant energy savings
  - The ECM has a health and safety component as well as energy conservation
  - The ECM is shown to be an integral part of a system that will produce significant energy savings

❖ All recommended measures included in the scope of work must be submitted to the Department in an ECM Data Sheet.

❖ Owners are responsible for project costs in excess of those that are funded by the program.

❖ Quantities of measures may not be reduced to meet SIR requirements.

4.7.8. Savings to Investment Ratio (SIR)

The SIR generally describes the value of the investment as compared to the savings provided by the measure over the measures life. A measure that provides an SIR of 1.0 means the savings provided by the measure is equal to the investment made in the measure.

The following data is required to calculate the SIR of an ECM:

- Annual Utility Cost Savings
- Measure Expected Useful Life (EUL)
- Investment Cost

SIR is calculated:

Annual Utility Cost Savings ($/yr) * Expected Useful Life (yrs) / Investment Cost ($)

- Annual utility cost savings is the avoided dollar amount achieved by installing an Energy Conservation Measure.
  - Annual utility cost savings is calculated by the quantity of annual reduction in utility consumption (kWh/Therm savings) multiplied by the current utility cost.
- Expected Useful Life (EUL)
  - EULs must be taken from the Department's EUL table.
  - If a measure cannot be found on the Department's EUL table, the source used to determine the EUL must be stated in the audit report as an assumption.
  - Hours of use is required to determine the expected useful life of all lighting measures and must be stated in the audit report.
- Investment Cost includes the cost of labor and material to install the efficient condition (measure).

4.8. ECM Data Sheet

The ECM Data Sheet is used to make the formal request for funding. It is also a communication tool used to relay information about the Energy Conservation Measures that exist for the project.

4.8.1. Data Entry

Data entry into the ECM Data Sheet must be concise and accurately describe the associated measure.

- Project information section must be completed.
- Pick from drop-down list for utility provider of electric and gas
  - Utility rates will populate automatically

Project Name:		*Square Footage of Project*	
Project Address:		*No. Units in Project:*	
		No. Buildings in Project:	
Auditor:			
Audit Company:		*Residential*	*0*
		Commercial	*0*
Electric Utility Provider:		*Commercial*	*0*
		Other Commercial Rate:	*0*
Gas Utility Provider:			
		Residential	*0*
ECMO:		*Commercial*	*0*

- Data Table: Data must be entered in all shaded or colored columns for each ECM.
  - Columns with no background color are calculations and will populate automatically.
- Measure description must state the action and location of the measure. (i.e. replace kitchen lighting).
- "Pre-retrofit Conditions" refers to what exists currently at the project.
- "Recommended ECM" refers to what the pre-retrofit condition is recommended to be replaced with.
- Specifications for both pre-retrofit conditions and recommended ECM must include efficiency ratings, size, type, and any other information relating specifically to the energy usage.
- If pre-retrofit and recommended ECM quantities are different, the reason must be stated in the "Description" column.

	Input Data	*Input Data PreRetrofit Conditions*		*Input Data Recommended ECM*	
Measure Category	Energy Conservation Measure (ECM) -- Description	Specifications (Size, type, efficiency, etc.)	Quantity	Specifications (Size, type, efficiency, etc.)	Quantity

- Electricity and gas savings are input in their respective columns "kWh Savings" and "Therm Savings"
- Cost savings for electricity and gas populate automatically.
- Total annual cost savings populates in "Annual $ Savings" column.

Input Data	*Calculation*	*Input Data*	*Calculation*	*Calculation*
kWh Savings	$ kWh Savings	Therm Savings	$ Therm Savings	Annual $ Savings

- Expected Useful Life column must be filled out using the Department's Expected Useful Life Table.

Input Data	*Calculation*	*Calculation*	*Calculation*
Expected Useful Life	**Lifetime kWh Saved**	**Lifetime Therm Saved**	**Lifetime $ Savings**

- The expected useful life for lighting measures must be calculated based on lighting type and hours of use.

Expected Useful Life Table

Measure		
Lighting:		
LED	Lighting Hours of Use	Years of Useful Life
Integrated screw base (SSL) - Omnidirectional, Directional Interior, exterior, residential and common areas	1	20.0
	2	20.0
	2.5	16.4
	3	14.0

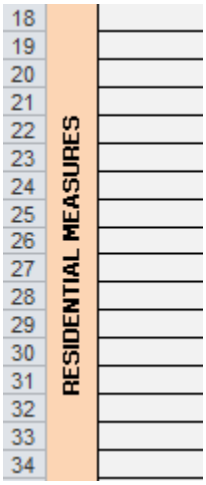
❖ Expected Useful Life Table can be found with the ECM Data Table on the "Useful Lives" sheet or on the Department's website.[10]

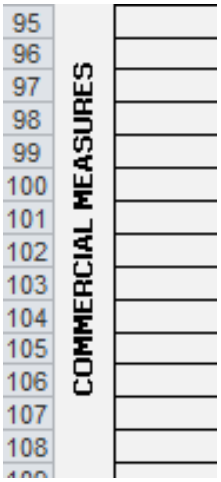
- Economic analysis must be performed in accordance with **Section 4.7.7.**
- Total measure cost must be listed in the "Measure Cost" column.
- SIR automatically populates in the "S.I.R." column.

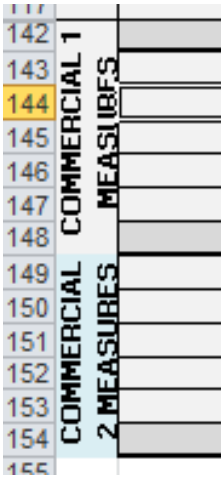
Input Data	*Calculation*	*Input Data*	*Calculation*	*Calculation*
Construction Budget Measure Cost	**Owner's Share**	**MEEHA-EmPOWER Approved**	**Simple Payback**	**S.I.R.**

[10] http://dhcd.maryland.gov/HousingDevelopment/Pages/EnergyEfficiencyWeatherization.aspx

- The rows are split into 4 categories which are labeled along the left side of the data sheet. These categories are:
  - Residential – All measures benefitting the tenant utility meter(s).
  - Commercial – All measures benefitting the owner's main utility meter(s).
  - Commercial 1 – All measures benefitting the owner's secondary utility meter(s) at a rate different than the main meter.
  - Commercial 2 – All measures benefitting the owner's third utility meter(s) at a rate different than the main and secondary meter.







❖ If the owner has only one electric utility meter, the sections for Commercial 1 and Commercial 2 are left blank.

❖ Typical cases where additional utility meters exist include separate meters for street or sight lighting, community buildings located separately from main building or leasing offices, etc.

4.9. Audit Report Review and Funding Determination

The audit report and ECM data sheet are submitted to the owner who submits it to the Department as part of the application process. The Department reviews the audit report and ECM data sheet to determine funding.

- The Department will approve, deny or request more information on each ECM.
- Auditors must answer Department questions within ten (10) business days.
- Building energy models must be adjusted to provide required data.

4.10. Construction Period

It is recommended the contractor and the energy auditor conduct an onsite walk-through of at least three units to discuss the ECMs and expected work products prior to starting construction.

- The contractor should be provided with a detailed checklist of the ECMs and all other measures that are to be performed prior to or during the walk-through.
- The auditor, building owner, and any other involved party should schedule standing meetings with the contractor on-site to review work and clarify any questions or issues that may arise.

4.11. Quality Assurance (QA) and Post Completion Inspections

Inspections by the energy auditor conducted during construction provide for verification that the ECMs are being installed correctly and provide early opportunity for corrective actions prior to completion of the project if needed. Inspections during construction are not mandatory but strongly recommended.

Post-completion inspections are mandatory and results of post-completion testing must be submitted to the Department prior to the owner receiving the final requisition.

4.11.1. Post-completion inspections

Visual inspection and diagnostic testing (blower door and duct diagnostic testing) is performed to determine if the ECMs are installed effectively and achieving intended results.

- Blower door testing must be performed to quantify building and/or unit level air leakage reduction.
- Duct diagnostic testing must be performed where duct sealing was part of the scope of work.
- Post-completion diagnostic testing must follow sampling protocol guidelines stated in **Section 4.3.2** to determine how many and which units to test.
- Results of verification and diagnostic testing must be reported to the Department prior to the release of the final requisition payment.
    - Post-completion inspection report must state the units entered and/or tested, measures inspected, type of test performed, and testing results.

4.12. Operations and Maintenance of ECMs

The contractor should work with the auditor to create a list of "Operations & Maintenance (O&M) Recommendations". Such recommendations should include the following types of information for specific systems/ECMs:

- Common problems to check for and avoid during installation (e.g. HVAC controls)
- Critical maintenance tasks to ensure performance (e.g. cleaning the filter on an HRV)
- Important resident responsibilities (e.g. thermostat set points)
- Annual maintenance milestones (e.g. exterior light controls)
- Proactive maintenance that prolongs the equipment or measure life vs. reactive repair

5. Design Team

The design team is comprised of several different professional competencies, each with a different but important role in the construction process. To develop the energy funded scope of work, the design team works together to build a comprehensive list of recommended energy conservation measures to be proposed for funding.

- The design team for retrofit projects will typically consist of:
  - Owner
  - Energy Auditor
  - Contractor
  - Engineer (occasionally)
- The design team for pipeline projects will typically consist of:
  - Owner
  - Energy Auditor
  - Architect
  - Engineer
  - Contractor

❖ The Design Team must include the auditor in conversations about the design of the project for all projects. Failing to do so will typically result in design flaws requiring changes to the scope of work that can impact the project construction schedule and budget.

5.1. Architect

The Architect is responsible for the design of pipeline projects that incorporate a more extensive renovation beyond the scope of energy funded measures. The Architect needs to work closely with the auditor in the design and pre-construction period to be sure all energy efficiency opportunities are considered in the initial design phase and the approved energy conservation measures are included in the project's scope of work. The auditor needs to know the final scope of work including the location and efficiency of energy measures (like lighting, appliances, and HVAC) to accurately calculate energy savings.

5.2. Contractor

The contractor is responsible for installing and/or commissioning the approved measures. Communication between the contractor and the rest of the Design Team is very important as understanding the scope of work will be instrumental in accurately determining cost and feasibility of each measure.

- Typically the contractor is responsible for completing the 212 and 215 Forms. On the 212/215 Forms, Energy-funded measures must be specifically listed with the associated funding amount.
- In cases where the cost of the measure is shared between Energy funds and any other funding source, the Form 215 must specify 2 separate lines for the same measure, one stating the amount of Energy funds and the other stating the rest of the cost of the measure (see sample below)

Description of Work		Estimated Units (Quantity)	Estimated Cost (Material and Labor)		
Code	Item		Per Unit	Unit	Total
071-00	**Total Waterproofing**				**$ 40,715.00**
071-01	Caulking and Sealant	1.0	$ 20,275.00	lump sum	$ 20,275.00
071-02	EmPower Funding for Air Sealing Units - Wall penetrations including electrical outlets, floor to wall intersections and plumbing items	56.0	$ 365.00	per unit	$ 20,440.00

- The AIA G702/703 must match the Form 212/215 as concerns Energy-funded measures.

5.3. Application

During the application period, the Design Team creates the scope of work and the owner goes through the application process to receive funding. As the energy auditor is developing the recommended list of energy conservation measures, the architect and contractor must ensure those measures are feasible and able to be installed as recommended. The Department requires the Design Team to provide specification sheets for those measures.

- Product specification sheets for energy funded measures must be submitted to the Department for the ECMO to review and approve.
  - Product specification sheets should be submitted prior to purchasing products
  - The product specification sheets must match or be more efficient than the efficiency stated in the grant or loan documents.

❖ An installed measure that does not meet or exceed the efficiency of the approved measure may have funding reduced or withdrawn.

- The contractor must provide the energy auditor with accurate costs for energy measures.
  - When determining the cost of a measure, the contractor must make sure the specifications for efficiency match the energy auditor's recommendation.
- For non-energy funded measures, the specifications (size, technology, etc.) and of each measure must be taken into account by the design team to prevent conflicts that may prevent the installation of the ECM. For example: if a lighting fixture is being replaced and the lamp for that fixture is funded, the new lighting fixture must be able to accommodate a lamp of the same design and same or better efficiency as the funded lamp.

5.4. Construction

The installation of energy funded measures must be in accordance with the manufacturer's installation instructions. The contractor must understand the scope of work for each funded measure before beginning construction. The ECMO will attend progress and requisition meetings, and perform site visits to inspect the progress of construction as it relates to the energy funded measures. Requisitions may be submitted to the Department as work is completed and an ECMO will inspect the installed measures. After project completion, an energy auditor must perform post-completion testing and verification of measures installed.

5.4.1. Site walkthrough with auditor

It is recommended the contractor and energy auditor perform a site walkthrough so the energy auditor can answer any specific questions about the scope of work for each measure.

- During the walkthrough, the auditor should describe in detail what work is expected to achieve the energy savings from each ECM.

5.4.2. ECMO site inspections

- The ECMO assigned to the project will perform site visit inspections to review the progress of the project and installation of ECMs.
- ECMs that have been incorrectly installed or installed in a way that will not achieve the calculated energy savings must be reinstalled properly or the funding amount is recalculated and adjusted to reflect the difference in energy savings.

5.4.3. Post-completion testing and verification

A visual inspection and diagnostic testing (blower door and duct diagnostic tests) is performed by a qualified energy auditor to determine if the ECMs are installed correctly and meeting intended results.

- Blower door diagnostic testing must be performed on every project to quantify building and/or unit level air leakage reduction.
- Duct diagnostic testing must be performed on projects where duct sealing was part of the scope of work.
- Post-completion diagnostic testing must follow sampling protocol guidelines stated in **Section 4.3.2** to determine how many and which units to test.
- Results of verification testing must be reported to the Department prior to the release of the final requisition.

5.5. Energy Funding Requisitions

A requisition is the official request for reimbursement of completed work. Funds are only disbursed on a reimbursement basis for installed work. Owners request funds by completing and submitting an energy requisition to the ECMO. A complete and accurate requisition documenting the proper use of funds and supporting documentation will ensure a more timely requisition payment. Energy Requisition Forms are created and supplied by the ECMO after the loan/grant agreement has been executed.

- Energy funds are disbursed during the course of construction as work is completed.
- The owner must use the Department's Energy Requisition Form to request funds.
- The owner must completely and accurately fill out the energy requisition form and submit it to the ECMO for review.
- An electronic draft of the energy requisition must be submitted to the ECMO at least three (3) days prior to the requisition inspection.
- All requisitioned measures must be inspected and approved by the ECMO.
- The ECMO may request the requisition to be revised if the installed ECMs do not match the approved measures on Exhibit B of the Agreement and on the requisition form.

Retrofit Projects:

- Owners will determine the schedule for requisitions. The requisition schedule should be based on the installation of grouped portions of measures and/or timeframes.
- The Energy Programs process retrofit payments.
  - 10% retention is held from each draw.
  - Retention is released upon final approval after all work has been satisfactorily completed.

Pipeline Projects:

- The energy requisition form is supplementary to the rental housing financing draw (AIA G702/703).
- Energy funds are typically requisitioned on the same schedule as the CDA draw.
- Expenses on the energy requisition form must match the requested energy expenses on the AIA G702/703 form for each draw.
- Items requisitioned for payment must be installed (stored items can't be paid with energy funds).
- Retention is not held from Energy funds.
- Multifamily Finance processes pipeline payments.

❖ Installed measures that do not match the approved measures on Appendix "B" of the agreement and submitted product specification sheets may result in a reduction or loss of funding.

5.6. Operations and Maintenance of ECMs

The contractor should work with the auditor to create a list of "Operations & Maintenance (O&M) Recommendations". Such recommendations should include the following types of information for specific systems/ECMs:

- Common problems to check for and avoid during installation (e.g. HVAC controls)
- Critical maintenance tasks to ensure performance (e.g. cleaning the filter on an HRV)
- Important resident responsibilities (e.g. thermostat set points)
- Annual maintenance milestones (e.g. exterior light controls)
- Proactive maintenance that prolongs the equipment or measure life vs. reactive repair

6. Conclusion

This Program Guide was created in an effort to define the roles of and provide guidance for members of the Department, owners, energy auditors and contractors involved in the multifamily energy efficiency funding program. These parties' responsibilities have been outlined herein in order for the process to run in a timely and efficient manner. This guide may be referenced by all parties involved throughout the funding process. Doing so will help achieve the Department's goal of maximizing energy efficiency and reducing overall energy demand in multifamily buildings throughout the State of Maryland.

7. Appendices

7.1. Glossary of Terms

Audit Report: The report created to communicate the existing conditions found during the audit, recommended energy conservation measures and results of the building energy model.

Blower Door Testing: A diagnostic test to determine the level of air leakage in a specific unit or building. Two types of blower door tests are used on multifamily buildings: Guarded and Unguarded.

> **Guarded Blower Door Test:** Will indicate the residential units (not the building's) total leakage to the exterior of the building.
>
> **Unguarded Blower Door Test:** Will indicate the unit's leakage rate to outdoors and adjoining units and other adjacent spaces.

Building as a System: The concept of a building being an integrated assembly of interacting components rather than a building with separate, non-interactive components. All components potentially impact the performance of the buildings energy efficiency, durability, comfort and indoor air quality.

Building Size: Low-Rise ($\leq$ 3 stories) or Mid/High-Rise (> 3 stories) building heights may impact the mechanical systems found within a multifamily building, as well as applicable codes/standards for fire safety, ventilation, etc.

Combustion Safety Testing: Testing combustion appliances (e.g. water heaters, furnaces and ovens) to ensure they are operating in a manner that does not cause harm to humans through the exposure of combustion gasses.

The Department (also DHCD): Maryland Department of Housing and Community Development is the state agency that administers multifamily energy programs.

Distribution System: The system of pipes or air ducts used by an HVAC appliance to deliver conditioned water, steam or air in order to heat or cool a specific area.

Economic Analysis: A systematic analysis performed in order to determine the monetary benefit from installing energy conservation measures.

Energy Audit: A comprehensive, on-site examination and documentation of the existing conditions of a property, historic energy consumption, and analysis of potential energy conservation measures.

Energy Conservation Measures (ECMs): An Energy Conservation Measure is an item or procedure that when implemented will result in a reduction of energy usage.

ECMO: Energy Construction Management Officer is a representative from the Department of Housing and Community Development assigned to the project. The ECMO manages the energy funding and installation of funded measures.

Building Energy Modeling: A computer software program used to create a model of the existing conditions of a property. This model can be used to determine the effects of ECM's and quantify energy reduction. Acceptable software programs include eQUEST, EA-Quip, REM Rate and TREAT.

Expected Useful Life (EUL): A combination of average equipment life and measure persistence, taking into account business turnover, early retirement of installed equipment, and other reasons measures might be removed or discontinued, resulting in the length of time that a measure is expected to be functional. The Department's Expected Useful Life Table must be used to determine measure EUL.

Heating Ventilation and Air Conditioning (HVAC): Systems used to condition air inside of a building.

HVAC Configurations: The overall design of an HVAC system used to heat and cool a building or unit. Two common HVAC configurations in multifamily buildings are central plants or individual, residential unit-level space heating and cooling units. Central systems have more extensive distribution systems (pipes, ducts) which may offer significant energy saving opportunities for measures such as insulating, air sealing, balancing, and improved controls. Individual HVAC systems can offer simpler, staged replacement opportunities.

Indoor Air Quality (IAQ): The temperature, humidity and chemical or biological contaminants of the air inside a building.

Non-Energy Upgrade Measures: Measures which will not necessarily reduce the energy use in the building, but may be advisable for the health and safety of the occupants and the durability of the building. A few examples are listed below, but there could be additional items depending upon the particular conditions of the building.

> **Building Ventilation:** Building ventilation in the pre-retrofit building may be inadequate and/or air sealing may create insufficient ventilation in the post-retrofit building. The post-retrofit building must comply with the applicable ventilation codes/standards for the program and building type (e.g. ASHRAE 62.1 or 62.2).
>
> **Moisture Management:** Any alteration to the building envelope may present issues with how the building drains water and manages moisture. These issues should be considered and steps taken to address them.
>
> **Fire Safety:** Numerous fire safety issues may arise as buildings are renovated and there is the opportunity to improve fire-rated assemblies. These cases should be anticipated as cascading requirements which follow from some ECMs.

Pipeline Project: A project receiving Low Income Housing Tax Credits (LIHTC) and/or Rental Housing Fund (RHF) funding from the Department's Community Development Administration (CDA) division.

Retrofit Project: A project of which only energy measures are being funded through the Department.

Sampling: The practice of viewing a representative amount instead of all possible. In multifamily buildings sampling may be used during on-site inspections to view and preform diagnostic testing on a representative amount of units. The information collected will be populated throughout the rest of the building. Sampling must be performed in accordance with BPI Multifamily Analyst Protocol.

Savings to Investment Ratio (SIR): The ratio of life-cycle savings to implementation costs. This number is the measure used for cost effectiveness. The Department provides the following formula for calculating the SIR of an ECM:

Yearly Energy Savings ($/yr) * Useful Life (yrs) / Implementation Cost ($)

Scope of Work: A detailed list of measures to be installed during construction.

Utility Metering Structure: The way in which utility services are supplied and billed. A multifamily building's utility metering will be structured in one of three ways: Individually Metered, Master-Metered, or Mixed-Metered.

Individually Metered: In Individually Metered buildings, all energy use is measured on the unit level with a single meter corresponding to each unit separately.

Master-Metered: In master-metered buildings, all energy use is measured with one or more central meters.

Mixed-meter: In mixed-meter configurations, one energy source (like natural gas) is centrally metered while another energy source (like electricity) is directly metered at each residential unit. This situation introduces elements of both the master-metered building and the individually metered configuration.

Utility Rates: The cost of utilities based on a per-amount basis of that utility. Reported utility rates must not include other charges found in the utility bills such as:

Time of Use Rates Charges: Charges put on utility bills at certain times based on the level of demand on the utility system

Demand-Based Charges: A charge based on the maximum load (expressed in kilowatts, or kW) placed on a utility's system by building equipment at any interval during the billing period. The monthly Demand Charge will vary depending on the equipment the building uses from month to month.

7.2. Expected Useful Life Table

Expected Useful Life Table

Measure		
Lighting:		
LED	Lighting Hours of Use	Years of Useful Life
Integrated screw base (SSL) - Omnidirectional, Directional Interior, exterior, residential and common areas	1	20.0
	2	20.0
	2.5	16.4
	3	14.0
	3.5	11.7
	4	10.2
	4.5	9.1
	5	8.2
	6	6.8
	7	5.9
	8	5.1
	9	4.6
	10	4.1
	11	3.7
	12	3.4
	16	2.6
	20	2.0
	24	1.7
All integrated fixtures, TLED, Pole/Arm or Wall Mounted Interior, exterior, residential and common areas	≤ 5	20.0
	7	19.6
	8	17.1
	9	15.2
	10	13.7
	11	12.5
	12	11.4
	16	8.6
	20	6.8
	24	5.7
Outdoor Canopy	≤ 9	20.0

	10	19.1
	11	17.4
	12	16.0
	16	12.0
	20	9.6
	24	8.0
Exit Sign	24	16.0
Indoor Parking Garage	24	8.0
De-Lamping (must be permanent, including removal of electrical sockets from the fixture)		15.0
Occupancy or Photo Sensor		10.0
Advanced Lighting Design		15.0
Insulation:		
Attic/ceiling/roof/wall		25.0
DHW tank wrap (electric DHW only)		5.0
DHW pipe insulation		15.0
Duct		20.0
Hydronic/steam distribution		15.0
HVAC:		
Air Source Heat Pump (Energy Star split system)		18.0
Ground Source Heat Pump		20.0
Central Furnace High Efficiency Fan motor		18.0
Room or Window Air Conditioner		12.0
PTHP		11.0
Central A/C (Energy Star)		18.0
High Efficiency Unitary A/C		15.0
Electric Chiller		23.0
Dual Enthalpy Economizer		10.0
Ductless Mini Split		18.0
Condensing Gas Furnace		18.0
Gas Boiler		18.0
Programmable Thermostat		7.5
Variable Frequency Drive (VFD) $\leq$ 10 HP		15.0
Duct Sealing		20.0
Heating Controls - Boiler Reset		15.0
Burner Replacement		10.0
Water Heaters:		

High Efficiency Gas/storage		13.0
Electric		13.0
Heat Pump Domestic Water Heater		13.0
Indirect storage		15.0
Solar		20.0
Low Flow Shower Heads		10.0
Faucet Aerators		5.0
Low-flow Toilet		20.0
Tank temperature turn down		2.0
Appliances:		
Refrigerators		12.0
Dishwasher		10.0
Freezers		11.0
Clothes Washer/(dryer) gas/electric		14.0
Dehumidifier (Energy Star)		12.0
Ceiling fan		15.0
Bathroom/Kitchen Fan		19.0
Other:		
Air Sealing		15.0
Advanced Power Strips (APS "smart strip")		4.0
High Efficiency Windows		25.0
Doors		15.0
Pool Pump 2-speed/Variable		10.0
Energy Management System (EMS)		10.0
Occupancy Sensor Ventilation Control		10.0
Reduce Over Ventilation		10.0
Vending Machine Controls		10.0
Energy Star roofing asphalt shingles		10.0
Solar Thermal System		20.0
Solar Photovoltaic (PV)		25.0
Elevator Pump/motor		20.0

*Audit reports must identify the source used for determining the measure life for recommended measures not included in this chart.