



Connecticut Housing Finance Authority

Construction Guidelines:
Energy Conservation

2014

These Guidelines are effective on January 1, 2014

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January 2014

I. Energy Conservation Guidelines

Building materials, components, fabrications, assemblies and equipment for all proposed development projects – rehabilitations and new construction – shall comply with the applicable sections of the current “Multifamily Design, Construction and Sustainability Standards – CHFA” (the Standards). In conjunction with the Standards, Technical Services has created a series of “Construction Guidelines” (CHFA Guidelines) to further assist Development Teams through the application, planning, design and review process. The CHFA “Construction Guidelines: Project Planning & Technical Services Review” and the Standards define and the specific design requirements and review process for multifamily housing financed through the Authority.

Energy efficiency effectiveness is strongly encouraged; an objective of CHFA is to maximize thermal efficiency and energy conservation in all developments. These “Construction Guidelines: Energy Conservation” outline the energy conservation requirements for developments funded through CHFA, and are intended to provide guidance for energy efficiency project planning and CHFA Technical Review, and for procurement of energy conservation-related financial incentives through the utilities. All applications must meet the Standards, and must comply with CHFA Procedures and the requirements of the CHFA/DOH Consolidated Application.

A. Energy Efficiency

CHFA requires “beyond Code” thermal efficiency and energy conservation measures in all developments. Development Teams must prepare and submit an Energy Conservation Plan with the finance application, which takes into consideration pre-development testing and energy audits of existing buildings for minor, moderate or substantial rehabilitations, and pre-development energy modeling for rehabilitation projects and new construction. An Energy Conservation form for submitting energy use and conservation data is included in the current Consolidated Application, and detailed Energy Conservation Plan requirements are outlined in section II.

1. For new and substantial rehabilitation projects, and equipment replacement, developments served by Connecticut Light and Power (CL&P) and the United Illuminating Company, the Connecticut Energy Efficiency Fund (CEEF) may be able to provide technical assistance with no- or low-cost design, construction and post-construction and occupancy evaluation services, and/or financial incentives to mitigate the fees for such services by third-party Energy Consultants, such as:
 - Custom and prescriptive incentives for installing energy-saving measures
 - Energy assessment services concerning building envelope components, lighting systems, building controls systems, HVAC systems, and maintenance and operations processes
 - Energy assessment services concerning blower-door testing (air leaks), air sealing, ductwork testing, hot water saving measures, and insulation evaluation
 - Financial incentives for purchasing and installing energy efficient equipment
 - Financial incentives for repairs and replacement, including Energy Management System maintenance
 - Technical, engineering and implementation retro-commissioning support
 - Financial incentives for energy-saving improvements such as boiler optimization and demand ventilation
 - Funds for qualified financial incentives can be committed to a project at the Design Development phase.
2. Information regarding local, state and federal incentives for renewable energy may be found through Energize CT, the Connecticut Energy Efficiency Fund (CEEF), Connecticut Light & Power (CL&P), The United Illuminating Company (UI), Connecticut Natural Gas (CNG), Southern Connecticut Gas (SCG) and Yankee Gas, the Connecticut Energy and Finance Authority (CEFIA) and the Database of State Incentives for Renewables and Efficiency (DSIRE).
3. A document in the Developer Document Library on the CHFA website, entitled “Energize CT Residential New Construction Program”, provides information regarding financial incentives that may be available through Connecticut Light & Power, United Illuminating, Connecticut Natural Gas, Southern Connecticut Gas and/or Yankee Gas, for providing certain energy conservation measures in multifamily developments

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in Connecticut. Listed are descriptions of eligible energy conservation measures, the potential financial incentives that are available, and the requirements necessary to earn the incentives.

B. Energy Efficiency Analysis

Energy Efficiency (EE) Projects can save energy by altering behavior, timing, technology and systems, including increased resident awareness through informational outreach, building control and energy management systems, building system upgrades, such as building envelope, lighting, ventilation and HVAC equipment, motors and drives, and potential Renewable Energy (RE) system retro-fit opportunities, such as geo-thermal, solar hot water and solar generation.

1. Energy Audit: “Energy Audit” is a term for a broad spectrum of energy studies ranging from a quick walk-through of a facility to identify major problem areas to a comprehensive analysis of the implications of alternative energy efficiency measures sufficient to satisfy the financial criteria of sophisticated investors. The main issues to be addressed by Energy Audits include:
 - a. An analysis of building and utility data, including study of the installed equipment, and energy bills
 - b. A survey of the real operating conditions
 - c. An understanding of building behavior and the interactions with weather, occupancy and operating schedules
 - d. Selection and the evaluation of energy conservation measures
 - e. An estimation of energy saving potential
 - f. Identification of customer concerns and needs.
2. Identifying EE Improvements: Energy Audits must address Owner questions regarding the benefits of EE Improvements, such as whether to repair or replace equipment and materials, how much energy use and cost would be reduced (typically 10% - 40%), what the costs to implement the changes would be, whether the proposed initiatives would qualify incentives and/or rebates, and what return on investment (ROI) and property value increase might be realized. The results of the Energy Audit must include recommendations for EE upgrades, increased Owner understanding of EE technologies, incentives and regulations, preparation for future incentive programs and progress toward pending mandates or regulations. Typical Energy Audit formats include the following:
 - a. Executive Summary
 - b. Existing Facility Description
 - c. HVAC and Mechanical Systems
 - d. Lighting
 - e. Building Envelope
 - f. Utility Analysis
 - g. Renewable Energy Options
 - h. ENERGY STAR Potential
 - i. Available Incentives
 - j. Additional Benefits and Next Steps
3. Criteria for Auditors and Energy Audits: Retain qualified professionals to perform all energy audits. Individuals who perform energy audits have a Professional Engineer's license in the State of Connecticut, or be a certified auditor/assessor/rater by the Association of Energy Engineers as a Certified Energy Manager (CEM), Building Performance Institute (“BPI”), Residential Energy Services Network Home Energy Ratings Systems (“RESNET HERS”) or ENERGY STAR. Recommended criteria for the selection of a qualified auditor/assessor/rater include:
 - a. Firms offering energy audits must provide documentation of the qualifications of the individual performing the audit
 - b. Auditors must indicate any special training or qualifications related to energy efficiency
 - c. Auditors must indicate any limitations or restrictions in their scope of services
 - d. Auditors must disclose if they have any affiliations with equipment manufacturers, vendors, distributors, installation contractors, or energy services contractors (ESCOs)

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4. Energy Audit Types/Levels: Common types/levels of energy audits are distinguished below, although the actual tasks performed and level of effort may vary with the consultant providing services under these broad headings. The only way to ensure that a proposed audit will meet your specific needs is to spell out those requirements in a detailed scope of work. Taking the time to prepare a formal solicitation will also assure the building owner of receiving competitive and comparable proposals. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has defined three progressive levels of energy audits:

[Note: CHFA recommends a minimum Level 2 energy audit for all funding applications.]

- a. **Level 1 – Walk-through analysis/preliminary audit**: Preliminary analysis made to assess building energy efficiency to identify not only simple and low-cost improvements but also a list of energy efficiency measures (EEMs) to orient the future detailed audit. This inspection is based on interviews with site personnel, visual verifications, study of installed equipment and operating data and a detailed analysis of recorded energy consumption. A Level 1 audit is intended to help understand where the building performs relative to its peers, establish a baseline for measuring improvements, decide whether further evaluation is warranted, and if so, where and how to focus that effort. The Level-1 also will outline the range of potential financial incentives available from Federal, State, Local, and Utility sources.
- b. **Level 2 – Energy Survey and Analysis**: Based on the results of the pre-audit, this type of energy audit consists of an energy use survey in order to provide a comprehensive analysis of the studied installation, a more detailed analysis of the facility, a breakdown of the energy use and a first quantitative evaluation of the ECOs/ECMs selected to correct the defects or improve the existing installation. This level of analysis can involve advanced on-site measurements and sophisticated computer based simulation tools to evaluate precisely the selected energy retrofits. Building energy systems are evaluated in detail to define a variety of potential energy-efficiency improvements. This must include the building envelope, lighting, Heating, Ventilation, and Air Conditioning (HVAC), Domestic Hot Water (DHW) and plug loads. This study starts with a detailed analysis of energy consumption to quantify base loads, seasonal variation, and effective energy costs, and includes an evaluation of lighting, air quality, temperature, ventilation, humidity, and other conditions that may affect energy performance and occupant comfort. The process also includes detailed discussions with the building Ownership, Management, and Occupants to explore potential problem areas, and clarify financial and non-financial goals of the program. The Level 2 audit must result in a clear and concise report to the Owner and Management Team describing a variety of EEMs, including no- and low-cost measures, modifications to system controls and building automation, operational changes, and potential capital upgrades. The findings must include general costs and performance metrics, as well as a means for the Owner to evaluate the EEMs and decide how to proceed with implementation.
- c. **Level 3 –Detailed Analysis of Capital-Intensive Modifications** focusing on potential costly EEMs: This type of “investment-grade” audit provides the Owner a much more thorough and detailed understanding of the benefits, costs, and performance expectations of undertaking the system upgrades or retrofits identified by the Level 2 audit that require significant investments of capital. The ASHRAE Level-3 audit focuses on a “whole-building computer simulation”, where a computer program is used to very accurately model the way the brick-and-mortar building would respond to changes in the energy systems, whether those are major HVAC retrofits or architectural modifications to walls, windows, and roof. A Level-3 audit involves much more detailed data, which is used to calibrate a computer model of the facility, so that proposed changes to energy systems can be simulated with very accurate results. Combining a Level 3 audit with construction-grade cost estimating supports informed investment decisions.

C. Typical EE Project Process

1. Initial Assessment: Energy Consultants discuss goals (such as ENERGY STAR Certification) and potential EE/RE opportunities with Owners and Property Managers

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2. Energy Audit: Energy Consultants perform a building study and present recommendations, including possible utility incentives and rebates
[Note: CHFA requires a minimum sample of residential energy use information from 10% of the units, and at least one of each unit type (number of bedrooms), to be used to estimate the total residential energy usage. However, in order to obtain the most accurate Energy Audit results, current energy usage information for the residential portions of buildings must include data from as many dwelling units as possible. In developments where the residents pay for their own utilities, individual lessees will have to agree to provide such information. Owners of all developments are strongly encouraged to draft a lease rider, which permits such information to be obtained directly from the utility companies.]
3. Solution Design: Energy Consultants develop a scope of work for competitive bid
4. Project Finance: Energy Consultants and Owners compare available options and secure funding, including utility incentives and rebates
5. Competitive Procurement: Energy Consultants solicit and analyze bids; Owners sign construction and incentive contracts
6. Installation: Energy Consultants provide field observation and construction contract administration
7. Incentives Acquisition: Energy Consultants provide required test results, reports and certificates to the utilities for release of incentives and rebates
8. Post-project: Energy Consultants and Owners may pursue ENERGY STAR Certification

II. Energy Conservation Plan

The Development Teams must prepare and submit an Energy Conservation Plan with the design development submission, which takes into consideration pre-development testing and energy audits of existing buildings for minor, moderate or substantial rehabilitations, and/or pre-development energy modeling for rehabilitation projects and new construction, prepared by a Professional Engineer and/or Building Performance Institute (“BPI”)-, Residential Energy Services Network Home Energy Ratings Systems (“RESNET HERS”)- or ENERGY STAR-certified Assessors/Raters. An Energy Conservation form for submitting energy use and conservation data is included in the current CHFA/DOH Consolidated Application

[Note: If tenants are responsible for utility costs, and usage information for all units is not currently tracked, a minimum sample of information for 10% of the units, and one of each unit type (number of bedrooms), may be used to estimate the total residential usage.]

A. Rehabilitation Project Definitions

1. Minor Rehabilitation
Construction renovations to existing buildings, consisting of items such as: Kitchen cabinet replacement; Bathroom vanity replacement; new wall, ceiling and floor finishes in Kitchens and Bathrooms; A/C unit and sleeve replacement, etc.
2. Moderate Rehabilitation
Construction renovations to existing buildings, consisting of items such as: Kitchen cabinet replacement; Bathroom vanity replacement; new wall, ceiling and floor finishes in Kitchens, Bathrooms and various other rooms in each apartment; exterior door replacement; exterior window replacement; roof replacement; exterior siding repair or replacement; new hot water heaters; hot water boilers; A/C unit and sleeve replacement; electrical service upgrade, etc.
3. Substantial Rehabilitation
Construction renovations to existing buildings, consisting of all items listed for Moderate Rehabilitation above, and the inclusion of up to 50% of the items listed for Gut Rehabilitation below.
4. Gut Rehabilitation
Construction alterations and renovations to existing buildings, consisting of complete removal, replacement or reconfiguration of: interior partitions and walls; ceiling and floor finishes; replacement of all interior doors and frames; replacement of building mechanical and electrical systems; modifications to existing structure and exterior wall systems, including window and exterior door replacements and new building insulation; replacement of existing roof system(s); replacement of all interior Kitchen cabinets and Bathroom vanities; painting of all rooms in each apartment and common areas, etc.

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B. Energy Use and Conservation Data for Minor, Moderate or Substantial Rehabilitations

If the application is for the minor, moderate or substantial rehabilitation of existing buildings, as defined below, the Energy Conservation Plan must include the following information:

1. Current Energy Usage:
 - a. Management/Common Area
 1. Total Electrical Usage for the past twelve months in kWh and MMBTU
 2. Total Fuel Oil Usage for the past twelve months in gallons and MMBTU
 3. Total Propane Usage for the past twelve months in ccf or Gallons, and MMBTU
 4. Total Natural Gas Usage for the past twelve months in ccf, therms and MMBTU
 - b. Residential Electrical Usage for the past twelve months in kWh
 1. Total Electrical Usage for the past twelve months in kWh and MMBTU
 2. Total Fuel Oil Usage for the past twelve months in gallons and MMBTU
 3. Total Propane Usage for the past twelve months in ccf or Gallons, and MMBTU
 4. Total Natural Gas Usage for the past twelve months in ccf, therms and MMBTU
2. Projected Annual Energy Usage (net decrease or increase upon completion of the proposed EE measures, as applicable):
 - a. Management/Common Area
 1. Total Projected Annual Electrical Usage in kWh and MMBTU
 2. Total Projected Annual Fuel Oil Usage in gallons and MMBTU
 3. Total Projected Annual Propane Usage in ccf or Gallons, and MMBTU
 4. Total Projected Annual Natural Gas Usage in ccf, therms and MMBTU
 - b. Residential Electrical Usage
 1. Total Projected Annual Electrical Usage in kWh and MMBTU
 2. Total Projected Annual Fuel Oil Usage in gallons and MMBTU
 3. Total Projected Annual Propane Usage in ccf or Gallons, and MMBTU
 4. Total Projected Annual Natural Gas Usage in ccf, therms and MMBTU
3. Proposed Energy Performance-related Improvement Summary: The Energy Conservation Plan must include a summary of all energy performance-related improvements included in the overall scope of proposed work, and information regarding the applicant's efforts to secure other energy efficiency-related funding partners, and/or government-/utility-sponsored incentive commitments.
4. Building Energy Performance Summary:
 - a. Total Current Energy Use for the past twelve months in MMBTU
 - b. Total Projected Annual Energy Use in MMBTU
 - c. Projected Reduction in Annual Energy Use in Percent
 - d. Cost of Energy Performance-related Improvements in Dollars
 - e. Projected Payback Period (Cost/Benefit Analysis) in Years

C. Energy Conservation Data for Gut Rehabilitations and New Construction

If the application is for the gut rehabilitation of existing buildings, or for new construction, the Energy Conservation Plan must include the following information:

1. Proposed Energy Performance-related Improvement Summary: The Energy Conservation Plan must include a summary of all energy performance-related assemblies and equipment included in the overall scope of proposed work, and information regarding the applicant's efforts to secure other energy efficiency-related funding partners, and/or government-/utility-sponsored incentive commitments.
2. HERS Index
 - a. Based on the EPA ENERGY STAR Qualified Home Version 3.0 HERS Index Target Procedure, the projected ENERGY STAR HERS Index Target for the project and the proposed HERS Index for the project (\leq ENERGY STAR HERS Index Target)
– or –
An indication that the applicant intends to adhere to the ENERGY STAR Qualified Home Version 3.0 Prescriptive Path

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- b. If the application is for the gut rehabilitation of existing high-rise buildings, or for the construction of a new high-rise building, and the building is eligible for the ENERGY STAR MFHR Version 1.0 Program (as determined by the EPA ENERGY STAR Multifamily New Construction Program Decision Tree), the Energy Conservation Plan must demonstrate $\leq 15\%$ annual energy cost savings over ASHRAE 90.1-2007 Standards requirements

– or –

An indication that the applicant intends to adhere to the ENERGY STAR MFHR Version 1.0 Prescriptive Path

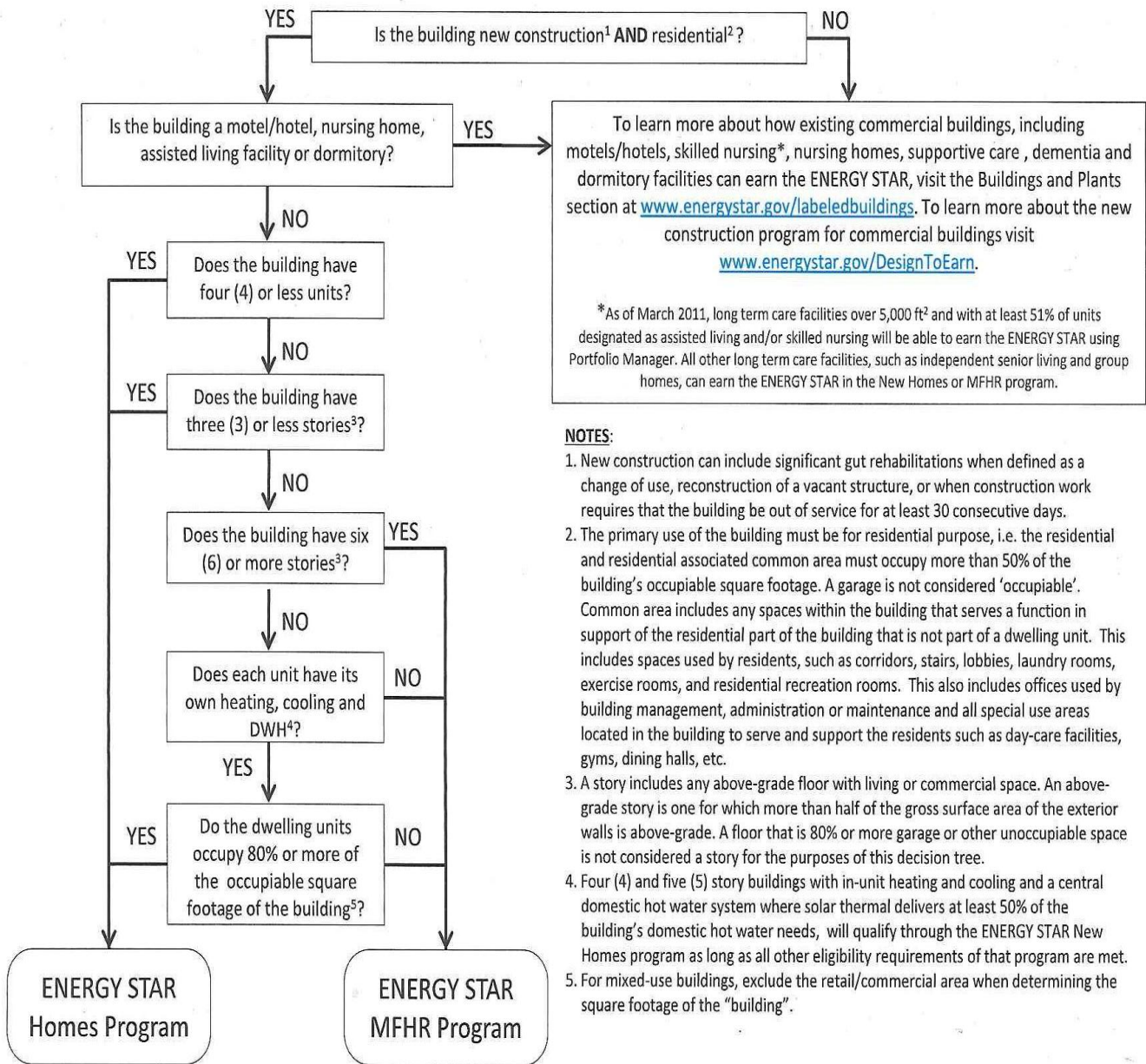
3. Professional Engineer and/or Certified Assessor/Rater Information: The Energy Conservation Plan must include the following information:
 1. Energy Consultant Name/Title
 2. Firm Name/Address
 3. Email Address
 4. Telephone Number

D. EPA ENERGY STAR Multifamily New Construction Decision Tree, Version 1.0 (See page 8)

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EPA ENERGY STAR Multifamily New Construction Program Decision Tree, Version 1.0



E. CHFA/CEEF Energy Incentive Process

To assist development funding applicants in obtaining financial incentives for energy efficiency measures, a coordinated outline of the CHFA project planning, design, and construction process, with the CEEF process for awarding energy incentives through the electric utilities serving the State of Connecticut is as follows:

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CHFA	Utilities
Pre-Design Phase	Pre-Design Phase
<p>Minor, Moderate and Substantial Rehab Projects: Owner/Developer commissions a Capital Needs Assessment (CNA) report, including a comprehensive energy assessment, in accordance with CHFA CNA requirements, in order to assess the physical condition and energy efficiency of the existing facilities, to determine the scope and budget for the proposed rehabilitation, and to establish a 20-year life-cycle replacement budget</p> <p>Gut Rehab Projects: Owner/Developer commissions a Structural Needs Assessment report in accordance with CHFA requirements</p>	<p>Development Team Kick-off Meeting with CEEF Program Administrator to review available programs and incentives</p>
Design Phase	Design Phase
<p>All Rehab and New Construction Projects: Owner/Developer commissions Architect/Engineers to design project in compliance with the Multifamily Design, Construction and Sustainability Standards (“the Standards”)</p> <p>Owner/Developer submits minimum 40% complete Construction Drawings and Specifications (CDs), Energy Conservation Plan and CEEF preliminary estimate of energy incentives with the CHFA/DOH Consolidated Application</p> <p>If eligible for funding, CHFA issues a Commitment Letter</p>	<p>Architect/Engineers design qualifying EE measures into the project; CEEF Program Administrator reviews CDs for qualifying measures and provides a preliminary estimate of energy incentives</p>
<p>Architect/Engineers complete CDs; EE measures are fully modeled/detailed/specified</p>	<p>Architect/Engineers complete CDs; EE measures are fully modeled/detailed/specified</p>
<p>Development Team submits 100% CDs (hard copy) to CHFA - Tech Services reviews for compliance with the Standards</p>	<p>Owner Developer submits 100% complete CDs (.pdf or hard copy) to CEEF Program Administrator - CEEF Program Administrator reviews plans for qualifying measures</p>
<p>Tech Services may request additional information from the Architect/Engineer</p>	<p>CEEF Program Administrator may request additional information from the Architect/Engineer</p>
<p>Tech Services accepts CDs for Initial Closing - Qualifying EE measures are identified - Development Team identifies project betterments to balance EE incentive funds</p>	<p>Utility creates a Letter of Agreement (LOA) with incentive amounts, energy savings details and verification requirements</p>
<p>CHFA Initial Closing</p>	<p>LOA is signed by Utility Management and Owner/Developer - Incentive dollars are earmarked specifically for the project</p>
<p>Tech Services Pre-Construction Meeting with Development Team - EE measures/incentive tracking requirements confirmed with Owner/Developer, Architect/Engineers/Energy Professionals & GC</p>	
Construction Phase	Construction Phase
<p>CHFA Field Observation - EE measure/incentive tracking by Owner/Developer, Architect/Engineers & GC</p>	<p>EE measure verification inspections/testing by HERS rater/utility staff</p>
<p>Project betterments implemented to balance sources and uses</p>	<p>Verification paperwork and other required data are submitted for utility staff review</p>
<p>Owner/Developer submits verification paperwork with other required information for CHFA Final Closing</p>	<p>Upon completion of review, project is processed for payment (larger projects can be paid in phases)</p>
<p>CHFA Final Closing</p>	