

## Best Practice – Unit Replacement

**Date:** Revised August 2018

**Subject:** Central or heat-pump unit replacement under Weatherization Program

**Question:** Can we replace air conditioner or central units under the weatherization program? We encounter very old units and enter the data into the energy audit but they never seem to rank with an SIR > 1, and thus we are not able to replace systems that appear to be on their last leg.

**Discussion:** It depends. Whether it is cost effective to replace a unit depends on over two dozen factors built into the analytics of the energy audit software program. The overall intent and spirit of the weatherization program is to reduce overall energy consumption so the client can realize the savings every month. This is most economically accomplished by insulation and air sealing to form a thermal boundary that will help keep the conditioned air inside the house which will make the house warm in winter and cool in the summer. Although replacement is sometimes necessary, a unit replacement-heavy program “drifts” from the original intent of the program, which is to provide weatherization improvement measures that will “pay for themselves”, in terms of savings, well within 15 years in most cases. Prior to the replacement of any central system, Subrecipients should assess and address the duct system, if necessary, to ensure that the conditioned air provided by the replacement unit will actually be delivered into the house to be enjoyed by the client.

### ENERGY CONSERVATION Considerations:

Any and all replacement units must meet or exceed current energy star rating requirements. All replacement units must be sized according to a properly run Manual J, as well as have the corresponding Manual S associated with it to support the selection of the equipment installed. All of this documentation must be maintained with the client file (electronically stored documentation is acceptable).

For DOE units: In theory, unit replacement is just the same as any other data entry into the energy audit for infiltration, insulation, etc. In reality, unit replacement is usually best pursued with close attention to detail and data entry to remain within the spirit and letter of the weatherization program. One error in terms of BTU consumption or SEER value, for example, and the determining values of unit ranking will be skewed in the energy audit. Unit replacements as an Energy Conservation Measure (“ECM”) must be properly justified in the energy audit with an SIR > 1.

The assessor-auditor should run the energy audit with “Evaluate All” to enable the software to evaluate if the replacement is an ECM. If the furnace does not rank as an energy-saving measure the auditor may split the costs between the three costliest components of the central system: 1) furnace 2) blower 3) air conditioner. The blower cost entry can flip-flop between the furnace and the AC, since the blower is a component of both systems. For example, for a \$6000 central HVAC system (installed) you would split the costs into the three components: \$2000 for each. The furnace cost plus the blower cost, because it could be a H&S measure, must be taken out of the SIR analysis. This can be accomplished in energy audit by checking the “replacement mandatory” and then checking the “do not include in SIR” box when it appears in the program. Now the cost of the central AC system (from the NEAT-SIR point-of-view) is reduced to \$2000. In most cases, especially with older AC’s, this reduced price will enable the replacement to rank with an SIR > 1. [Note: Regarding the blower, whether or not there are H&S issues, the cost of the blower can be split 50/50. Its costs can be allocated half to the furnace side of the unit and half to the AC side, when entering cost data into NEAT.]

--In review, there are three ways to allocate the cost of the blower, which is used by both systems: 1) Allocate actual costs of components [include vendor documentation of prices in file]. 2) Split total unit

costs into three equal parts and flip-flop the cost of the blower to either side (example above). 3) After a 3-way split of actual costs (or equal parts) allocate the cost of the blower equally to both sides (example: Actual AC cost-\$1500, furnace-\$1000, blower-\$500; then allocate blower costs to each side: AC cost-\$1750, furnace cost-\$1250) and run NEAT to see if SIR >1 is achieved. If SIR >1 cannot be gained via these three cost allocation techniques, the measure does NOT rank.

In the case of a fully functional, but inefficient and aged, air conditioner the assessor-auditor can use the same above methodology to determine if it is cost effective to replace the unit. For example, if one of the components ranks and replacement of the component is pursued, then the cost of the component for energy audit entry should be determined by the three component split discussed above.

Non-functioning units are not necessary excluded from repair or replacement in the Weatherization program. In the case of an existing, but entirely non-functional unit, the Subrecipient must make a careful assessment, apply judgment, and make a determination with the following principles and methodology in mind (evaluate and balance the following {competing} considerations):

1. The central guiding principle of the WAP program is to decrease energy consumption. It would increase energy consumption if a defunct (zero consumption) unit is replaced with a new or repaired unit (increased consumption).
2. Look for cost effective options with the lowest SIR. In any case the unit replacement must be sanctioned by a SIR of 1 or greater. If the replacement or major repair does not rank in the energy audit, the unit should not be replaced.
3. Determine the living-space requirements of the resident(s) to help determine if the defunct needs to be repaired or replaced. For example, if someone lives only in the downstairs part of the house, the semi-conditioned space upstairs may not justify replacement of the broken central system; a tune-up of existing window units downstairs may suffice.
4. Consider the well-being and comfort of the client.
5. Run a manual J to make sure any unit selection makes economic and weatherization sense for the dwelling.

If the Subrecipient still has questions, or there is confusion as to whether an existing non-functional unit should be eligible for replacement or repair, please consult TDHCA program staff.

Here is a listing of the data “double-checks” you should accomplish in the energy audit when you have encountered a unit that you suspect is a “candidate” for unit replacement under the WAP and energy audit program. Verify correct data entry for (both furnace and A/C):

- BTU size of existing unit.
- SEER of existing unit (very important: use the most accurate SEER that can be determined; use the degradation calculator for older units).
- SEER of replacing unit (this is often wrong so double-check).
- BTU of replacing unit.
- Pricing and replacing unit data in the energy audit library.
- Rerun the energy audit program.

It is important to note that this data entry work should be done with attention to detail and in a scrupulous manner. A data entry error can result in a satisfactory unit being replaced or an unsatisfactory unit not identified for replacement.

If a unit replacement does not have an SIR ranking with a 1.0 or greater then we **should not and canNOT** replace the unit as an ECM. Replacement of the unit as a H&S measure is a possibility, as outlined below.

*For LIHEAP Only units:* Complete replacements of a furnace, AC, or HVAC as an energy efficiency measure are possibilities when utilizing the LIHEAP Priority List. There is further defining guidance in the Priority List that establishes the thresholds that must be met to justify the replacement of a unit. Degradation of AFUE and/or SEER to be below a certain amount is the current required justification for replacement of a unit as an ECM. The Department has an excel degradation calculator posted on its website to be used to justify each and every unit replaced with LIHEAP funds. Subrecipients should review the Priority List in their current program year contract at least annually for any changes, specifically paying attention to any changes made in the Priority List.

*For DOE & LIHEAP leveraged units:* Follow DOE guidance outlined above

#### HEALTH & SAFETY (H&S) Considerations:

It is important to note that health and safety is also a prime concern in the program. Issues related to carbon monoxide are of primary concern whenever units (with combustion-based heat) are evaluated or replaced. Air conditioning issues may have health and safety aspects, but that is not commonplace and is usually addressed by consulting HVAC licensed technicians.

Replacement of units as H&S must have documentation supporting the H&S issue with the existing original equipment to justify the replacement. Examples of reasons to justify a unit replacement under H&S: high CO readings, cracked heat exchanger; noncompliance with code requirements (no ODS). Other potential H&S issues that need to be addressed, but not require complete unit replacement, would be: failure of draft testing (address the venting system), gas leak (identify and then fix the leak), electrical issues (fix the wiring issue(s)), etc. Given that H&S expenditures are capped at 20% for the contact, Subrecipients should work diligently to minimize the H&S expenditures wherever possible, despite what an HVAC contractor might suggest. Using diagnostic tools, like a combustion analyzer, can provide valuable information about diagnosing the problem(s), which might not require the full replacement costs of \$2000-5000.

Reminder, the same criteria identified above apply to replacements under H&S: Any and all replacement units must meet or exceed current energy star rating requirements. All replacement units must be sized according to a properly run Manual J, as well as have the corresponding Manual S associated with it to support the selection of the equipment installed. All of this documentation must be maintained with the client file (electronically stored documentation is acceptable).

**Recommendation Summary:** Always allow the energy audit to initially evaluate if heating/cooling units can be replaced as an ECM by using the "Evaluate All" Retrofit Option first. If the unit ranks with an SIR of 1 or greater it may be performed as a weatherization measure, which saves H&S funds. For LIHEAP only units, justification for replacement must be in accordance with current year Priority List guidance, which includes the calculated degradation of that unit's AFUE and/or SEER rating. Replacement of units as H&S require that sufficient documentation of the H&S issue be maintained in the file.

Reminder: prior to the replacement of any central system, Subrecipients should assess and address the duct system, if necessary, to ensure that the conditioned air provided by the replacement unit will actually be delivered into the house to be enjoyed by the client.