Nature's Cooling solutions

Amanda Stevens
US Environmental Protection Agency
1200 Pennsylvania Ave., MC 6202J
Washington, DC 20460

December 9, 2013

Dear Ms. Stevens:

Nature's Cooling Solutions respectfully submits the following comments in response to your " ENERGY STAR® Room Air Conditioners Framework Document" from November 2013.

Residential air conditioning has expanded beyond SEER, the traditional equipment rating. Utilizing a total systems approach, new standards have now been applied. As a result, requirements for duct testing were added to the International Energy Conservation Code which benefit the consumers and energy efficiency. Nature's Cooling Solutions believes that a similar approach will also benefit the room air conditioner product. Current testing standards for room air conditioners have increased the efficiency and reduced operating costs, but they have limited innovation and inclusion of other proven technology. We support the concept of expanding Energy Star's residential window air conditioning program to include areas that are not covered by the current DOE energy efficiency test procedures. There are significant opportunities to reduce energy losses or energy costs that are not considered in the current DOE standards. Many of these opportunities may have a much lower cost and faster payback than the traditional refrigeration system improvements that are captured by the current DOE standards. Our recommended technologies are already proven in other air conditioning applications and are outlined below.

Improved installation practices- We recommend setting a two part standard for residential window air conditioners: one for infiltration losses and one for heat conduction losses.

Infiltration losses - This practice would reduce infiltration outside of the perimeter of the room air conditioner but within the installation envelope by providing better sealing methods. We support this proposal and suggest a prescriptive requirement for sealing. Units should provide a method for sealing air gaps around the unit and around any installation kit such as wing panel kits. A study should be completed to determine a practical level of infiltration and the standard should be set to require that as the maximum permitted infiltration. A similar approach has already been used for residential duct systems, requirements for duct testing were added to the International Energy Conservation Code [1] This may require multiple levels for different capacity room air conditioners and different types of room air conditioners.

-Conduction losses. This practice will reduce conduction heat loss outside of the perimeter of the room air conditioner and within the installation envelope by providing improved insulation. We recommend that any opening that is outside of the room air conditioner perimeter and within the installation

envelope be insulated. Since many room air conditioners are installed in windows we recommend using the Energy Star standard for residential windows as a baseline for this insulation. Residential windows require a U heat transfer factor of 0.3 to 0.6 depending on climate zone. It is impractical to have multiple standards for room air conditioners for the different climate zones. We recommend that room air conditioners start with meeting the minimum insulation standard of 0.6 BTU/hr-ft2-F. The equivalent R factor is 1.66 ft2-hr-F/BTU. As an example this could be accomplished with an insulated panel of less than 0.5 inches in thickness which would be compatible with most room air conditioner wing panels. The standard should require the insulation performance and not define the method. We recommend this be required for any potential openings of greater than 2 square inches which would also capture the space between the window panes on an open window. The study that was completed by NREL[2] considered infiltration losses but did not measure or simulate conduction losses. Installed window air conditioners can have up to 180 square inches of uninsulated accordion panels and sash openings which will allow significant heat loss between the indoor and outdoor spaces.

Programmable Thermostat – Using a programmable thermostat, you can adjust the times you turn on the heating or air-conditioning according to a pre-set schedule. Programmable thermostats can store and repeat multiple daily settings (six or more temperature settings a day) that can be manually overridden without affecting the rest of the daily or weekly program. By turning the thermostat back 10° to 15° for 8 hours per day, you can save 5% to 15% a year in cooling expenses -- a savings of as much as 1% for each degree if the setback period is eight hours long. The percentage of savings from setback is greater for buildings in milder climates than for those in more severe climates.[3]

Remote Room Temperature Sensor – Many room air conditioners cycle the fan during the off cycle to improve the accuracy of the air temperature in the room. The fan energy used could be eliminated if the thermostat was placed on a wall or in the room space. We recommend that consideration should be given to include it as part of the version 4 energy star specifications.

Integrated Fresh Air Cooling - Fresh air cooling is a known technology that has proven to be an effective way to reduce cooling energy by substituting outdoor air cooling for compressor cooling. The diurnal temperature differences of 15 to 25 degrees make outdoor air cooling practical for many mornings and nights and can provide significant savings. Commercial buildings and data centers have used economizers for many years to effectively reduce the cost of cooling. They have proven so effective that they are now required in more than 60% of the commercial building applications in the United States. A study by the US Department of Energy concluded that cooling with advanced economizer systems could produce energy savings between 38% and 67% in small office buildings.[4]

Fresh air cooling has a significant potential to reduce energy consumption in homes and offices being cooled with room air conditioners. We are not aware of any studies that have been done to quantify the room air conditioner potential and we recommend that a study be undertaken. In residential applications the use patterns and the cooling loads are different than small office buildings. Small office cooling demand is primarily in the warmer daytime periods with only small demands at night. Room air conditioners installed in commercial buildings or in residential daytime living spaces could have energy

savings that are similar to the small office buildings in the 38% to 67% range. In addition many room air conditioners are installed in bedrooms and should be able to take advantage of night time fresh air cooling for a larger portion of the cooling needs. The energy savings could be even greater than those of office buildings.

We are confident that integrating fresh air cooling in room air conditioners is very feasible and cost effective. It would provide a substantial payback for consumers. Our company has experience with residential fresh air cooling systems and has been successfully selling a window based system for the last 2 years. We have found that consumers embrace the concept of fresh air cooling for the energy savings. While it is beyond the scope of Energy Star we have also found that consumers also appreciate the indoor air quality improvements provided by cooling with fresh outdoor air. Integrating fresh air cooling in room air conditioners is a simple extension of an existing technology. . We believe that that integrated fresh air cooling will provide measurable energy savings and would also provide improved performance/comfort for consumers. We recommend that consideration should be given to include it as part of the version 4 energy star specifications.

Thank you for your consideration of Nature's Cooling Solutions comments. Please contact me with any questions.

Respectfully,

George Wiese, President

Jim Wiese, Founder

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Footnote

1. Add residential duct standard source

2. http://www.nrel.gov/docs/fy13osti/57617.pdf

3. http://energy.gov/energysaver/articles/thermostats

4. Energy Savings and Economics of Advanced Control Strategies for Packaged Air-Conditioning Units with Gas Heat, PNNL-20955, W Wang Y Huang S Katipamula MR Brambley, US Dept. of Energy, 2003 http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20955.pdf