

Appliance Standards and Rulemaking Federal Advisory Committee
Central Air Conditioners and Heat Pumps Working Group
Final Term Sheet
January 19, 2016

Background

On July 14, 2015, DOE published a Notice of Intent to Establish the Central Air Conditioners and Heat Pumps Working Group to Negotiate a Notice of Proposed Rulemaking (NOPR) for Energy Conservation Standards. 80 FR 40938. This working group is established under the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) in accordance with the Federal Advisory Committee Act and the Negotiated Rulemaking Act. The purpose of the working group was to discuss and, if possible, reach consensus regarding the development of amended energy conservation standards for central air conditioners and heat pumps as well as provide recommendations to DOE regarding certain aspects of the proposed test procedure that are relevant to the amended energy conservation standard being considered by the group (i.e., limited to certain aspects proposed in Appendix M1), as authorized by the Energy Policy and Conservation Act (EPCA) of 1975, as amended. The working group was to consist of representatives of parties having a defined stake in the outcome of the energy conservation standards and to consult as appropriate with a range of experts on technical issues.

Ultimately, the working group consisted of 15 members, including one member from ASRAC and one DOE representative (see Appendix A). The working group met ten times. The meetings were held on August 26, September 10, September 28-29, October 13-14, October 26-27, November 18-19, December 1-2, December 16-17, January 11-12, and a webinar on January 19. The working group successfully reached consensus on amended energy conservation standards and the associated compliance date for certain product classes of central air conditioners and central air conditioning heat pumps, on limited aspects of the proposed, amended test procedure Appendix M1, and also on a handful of other miscellaneous topics related to the standards rulemaking. This document includes the working group's recommendations to ASRAC.

Appendix M1 Test Procedure

Definitions for Appendix M1

Recommendation #1.

The following definitions capture the intent of the working group and should be adopted as is or as modified in a manner that captures the same intent. For those definitions that contain a maximum external static pressure (ESP) requirement, the unit's maximum ESP would be determined using a dry coil test without electric heat installed and without an air filter installed at the unit's certified air flow, or, if the air flow is not certified, at an air flow of 400 cfm per ton of certified capacity. For those condensing units distributed in commerce with different indoor unit combinations, each specific combination would need to meet the applicable definition in order to be rated with the associated static.

- A ceiling-mount blower coil system is a split-system central air conditioner or heat pump that

contains a condensing unit and an indoor unit intended to be exclusively installed by being secured to the ceiling of the conditioned space, with return air directly to the bottom of the unit (without ductwork), having an installed height no more than 12 inches (not including condensate drain lines) and depth (in the direction of airflow) of no more than 30 inches, with supply air discharged horizontally. The certified cooling capacity must be less than or equal to 36,000 Btu/h.

- A wall-mount blower coil system is a split-system central air conditioner or heat pump that contains a condensing unit and an indoor unit intended to be exclusively installed by having the back side of the unit secured to the wall within the conditioned space, with capability of front air return (without ductwork) and not capable of horizontal airflow, having a height no more than 45 inches, a depth of no more than 22 inches (including tubing connections), and a width no more than 24 inches. The certified cooling capacity must be less than or equal to 36,000 Btu/h.
- Manufactured housing air conditioner coil system is a split system air conditioner or heat pump that contains a condensing unit with an indoor unit that: (1) is distributed in commerce for installation only in a manufactured home with the home and equipment complying with HUD Manufactured Home Construction Safety Standard 24 CFR Part 3280; (2) has an external static pressure that must not exceed 0.4 inches of water; and (3) has an indoor unit that must bear a label in at least ¼ inch font that reads “For installation only in HUD Manufactured Home per Construction Safety Standard 24 CFR Part 3280.” Note, manufacturers must certify which combinations are manufactured housing air conditioner coil system.
- Low static system means a ducted multi-split or multi-head mini-split system where all indoor sections produce greater than 0.01 and a maximum of 0.35 inches of water of external static pressure when operated at the full-load air volume rate not exceeding 400 cfm per rated ton of cooling.
- Mid static system means a ducted multi-split or multi-head mini-split system where all indoor sections produce greater than 0.20 and a maximum of 0.65 inches of water of external static pressure when operated at the full-load air volume rate not exceeding 400 cfm per rated ton of cooling.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 1/19/2016

Minimum External Static Pressure

Recommendation #2.

The following minimum external static pressure values should be used for testing central air conditioners and heat pumps:

Product Description	Minimum External Static Pressure Values (inches of water)
All Central Air Conditioners and Heat Pumps Except (2)-(7) below	0.50
(2) Ceiling-mount and Wall-mount Blower Coil System	TBD by DOE
(3) Manufactured Housing Air Conditioner Coil System	0.30
(4) Low Static System	0.10
(5) Mid Static System	0.30

(6) Small Duct, High Velocity System	1.15
(7) Space Constrained	0.30

The proposal made in the 11/09/15 SNO PR for an ESP adjustment for blower-coil units with a condensing furnace should not be adopted.

Vote results: Consensus (15 yes, 0 no votes, 0 abstentions) on 1/19/2016

Default Fan Power

Recommendation #3.

- The default fan power for calculating performance of coil-only systems should be 441 W/1000 cfm. The corresponding heat addition to be used in adjusting the capacity should be 1,505 Btu/h/1000 cfm. DOE will calculate an alternative default fan power for manufactured Housing Air Conditioner Coil System based on the static in recommendation #2.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 1/19/2016

Heating Load Line

Recommendation #4.

DOE should review the record, including the information provided from the subgroup, and determine the appropriate heating load line.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 1/19/2016

Recommendation #5.

- The test procedure for variable speed heat pumps should allow an optional low ambient maximum speed test at 5°F or at low cut-off temperature. If manufacturer chooses to perform the low ambient max speed test, the heating performance would be determined based on an interpolation between the 17°F and 5°F test points (or other low ambient test point at the cut-off temperature) instead of calculating heating performance for ambient temperatures 12°F and lower using an extrapolation between the 17°F and 47°F test points.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 1/19/2016

Compliance Date for Appendix M1

Recommendation #6.

- The compliance date for representations based on Appendix M1 will be January 1, 2023.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 1/19/2016

Overall Regulatory Scheme - General

Recommendation #7.

DOE will implement the associated regulatory language to help ensure the following requirements are met for single-split system air conditioners:

- Every combination distributed in commerce must be rated.
 - Every single-stage and two-stage condensing unit distributed in commerce (other than a condensing unit for a 1-to-1 mini split) must have at least 1 coil-only rating that is representative of the least efficient coil distributed in commerce with a particular condensing unit.
- Every condensing unit distributed in commerce must have at least 1 tested combination.
 - For single-stage and two-stage condensing units (other than condensing units for a 1-to-1 mini split), this must be a coil-only combination.
- All other combinations distributed in commerce for a given condensing unit may be rated based on the application of an AEDM or testing in accordance with the applicable sampling plan.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 01/19/2016

Amended Energy Conservation Standards and the Associated Compliance Dates (as determined by Appendix M)

Recommendation #8.

Each central air conditioner and central air conditioning heat pump manufactured on or after January 1, 2023, shall have a Seasonal Energy Efficiency Ratio and Heating Seasonal Performance Factor, where applicable, not less than the values listed in the national column below. In addition to meeting the applicable national requirements, each split-system central air conditioner manufactured on or after January 1, 2023, and installed in the associated Southeast region, shall have a Seasonal Energy Efficiency Ratio not less than the values listed in the Southeast column below. In addition to meeting the applicable national requirements, each split-system central air conditioner manufactured on or after January 1, 2023, and installed in the associated Southwest region, shall have a Seasonal Energy Efficiency Ratio and an Energy Efficiency Ratio not less than listed in the Southwest column below.

Product Class	National		Southeast*	Southwest**	
	SEER	HSPF	SEER	SEER	EER
Split System Air Conditioners with a Certified Cooling Capacity <45,000 Btu/h	14		15	15	12.2/10.2***
Split System Air Conditioners with a Certified Cooling Capacity ≥45,000 Btu/h	14		14.5	14.5	11.7/10.2***
Split System Heat Pumps	15	8.8			
Single-Package Air Conditioners and Heat Pumps	14	8.0			11.0

*Southeast includes: The states of Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virginia, the District of Columbia, and the U.S. territories.

** Southwest includes the states of Arizona, California, Nevada, and New Mexico

*** The 10.2 EER amended energy conservation standard applies to split system air conditioners with a seasonal energy efficiency ratio greater than or equal to 16.

Note: The energy conservation standards for small-duct high velocity and space-constrained remain unchanged from current levels.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 01/19/2016

Amended Energy Conservation Standards and the Associated Compliance Dates (as determined by Appendix M1)

Recommendation #9.

DOE translated recommendation #8 into the following amended energy conservation standards as measured under Appendix M1 expressed in the new metrics (SEER2, HSPF2, and EER2).

Each central air conditioner and central air conditioning heat pump manufactured on or after January 1, 2023, shall have a Seasonal Energy Efficiency Ratio² and Heating Seasonal Performance Factor², where applicable, not less than the values listed in the national column below. In addition to meeting the applicable national requirements, each split-system central air conditioner manufactured on or after January 1, 2023, and installed in the associated Southeast region, shall have a Seasonal Energy Efficiency Ratio² not less than the values listed in the Southeast column below. In addition to meeting the applicable national requirements, each split-system central air conditioner manufactured on or after January 1, 2023, and installed in the associated Southwest region, shall have a Seasonal Energy Efficiency Ratio² and an Energy Efficiency Ratio² not less than listed in the Southwest column below.

Product Class	National		Southeast*	Southwest**	
	SEER2	HSPF2****	SEER2	SEER2	EER2
Split System Air Conditioners with a Certified Cooling Capacity <45,000 Btu/h	13.4		14.3	14.3	11.7/9.8****
Split System Air Conditioners with a Certified Cooling Capacity ≥45,000 Btu/h	13.4		13.8	13.8	11.2/9.8****
Split System Heat Pumps	14.3	7.8/7.1			
Single-Package Air Conditioners and Heat Pumps	13.4	7.1/6.5			10.6

*Southeast includes: The states of Alabama, Arkansas, Delaware, Florida, Georgia, Hawaii, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virginia, the District of Columbia, and the U.S. territories.

** Southwest includes the states of Arizona, California, Nevada, and New Mexico

*** The 9.8 EER amended energy conservation standard applies to split system air conditioners with a seasonal energy efficiency ratio greater than or equal to 15.2.

**** The first HSPF2 number represents a heating load line with a slope of 1.02, while the second HSPF2 number represents a heating load line with a slope of 1.3. DOE should finalize, as appropriate, consistent with its determination of the heating load line slope per recommendation #4.

Note: The energy conservation standards for small-duct high velocity and space-constrained remain unchanged from current levels but will be translated to Appendix M1 values.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 01/19/2016

Recommendation #10.

- DOE will implement the following accommodation for representative values of split system air conditioners and heat pumps based on the M1 methodology:
 - By 1/1/2023, manufacturers of single-split systems must validate an AEDM that is representative of the amended M1 test procedure by:
 - Testing a single-unit sample of 20-percent of the basic models certified;
 - The predicted performance as simulated by the AEDM must be within 5 percent of the performance resulting from the test of each of the models.

- Although DOE will not require that a full complement of testing be completed by 1/1/23, manufacturers are responsible for ensuring their representations are appropriate and that the models being distributed in commerce meet the applicable standards (without a 5% tolerance).
- By 1/1/2023, manufacturers must either determine representative values for each combination of single-split system central air conditioners and heat pumps based on the M1 test procedures using a validated AEDM or through testing and the applicable sampling plan.
- By 1/1/2023, manufacturers of multi-split, multi-circuit, or multi-head mini-split systems must determine representative values for each basic model through testing and the applicable sampling plan.
- By 7/1/2024, each model of condensing unit of split system air conditioner or heat pump must have at least 1 combination whose rating is based on testing using the M1 test procedure and the applicable sampling plan.

Vote results: Consensus (14 yes votes, 0 no votes, 1 abstention) on 01/19/2016

Recommendation #11.

All parties recognize that the performance for any HVAC system relies on high quality installation. A typical residential system can lose 20% to 40% of the energy available at the equipment plenum because of poor installation practices, depriving the homeowner of expected gains in efficiency while increasing operating costs.

Typical deficiencies include: (1) selecting the wrong equipment for the home (climate conditions, capacity sizing, matching of components and controls, application usage), (2) poor installation and commissioning procedures (issues include: refrigerant charging, airflow/waterflow), (3) poor design, installation, and retrofitting of the air distribution system (excessive air leakage in supply or return, high ESP, under insulation of ducts), and (4) failing to assure that the owner can operate the system as designed.

All parties commit to exploring routes to improve installations for all consumers, using multiple processes and approaches, ranging from policies (such as tax incentives or inspections) to improved training and consumer information. Within six months, DOE shall convene a workshop for all stakeholders to consider and rank alternatives, and to develop a road map for action, including both technical and policy items.

Vote results: Consensus (15 yes votes, 0 no votes, 0 abstentions) on 01/19/2016

This term sheet has been approved by the ASRAC CAC and CHP Working Group by unanimous consensus (15 yes – 0 no – 0 abstain) on 1/19/2016. It can now be passed on to ASRAC for consideration. It should be noted that the exact language in this term sheet may be modified when implemented by the Department as regulatory text, but the intent should remain unchanged.

Appendix A—Members

U.S. Department of Energy—ASRAC

Central Air Conditioners and Central Air Conditioning Heat Pumps Working Group

Don Brundage	Southern Company
Kristin Driskell	California Energy Commission
John Gibbons	United Technologies
Marshall Hunt	Pacific Gas & Electric Company, San Diego Gas & Electric Company, Southern California Edison, and Southern California Gas Company
John Hurst	Lennox
Charles McCrudden	Air Conditioning Contractors of America
Karen Meyers	Rheem Manufacturing Company
Karim Amrane	Air-conditioning, Heating, and Refrigeration Institute
Steve Porter	Johnstone Supply
Harvey Sachs	American Council for and Energy Efficient Economy
Rusty Tharp	Goodman Manufacturing
Jim Vershaw	Ingersoll Rand
Meg Waltner	Natural Resources Defense Council
Andrew deLaski	Appliance Standards Awareness Project
Tony Bouza	U.S. Department of Energy