

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
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OFFICE OF  
AIR AND RADIATION

**Summary of Rationale for Version 4.0 ENERGY STAR<sup>®</sup> Central Air Conditioner and Air Source Heat Pump Specification  
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**I. Introduction and Background**

This memorandum provides a summary of the rationale and key inputs that culminated in Version 4.0 of the Central Air Conditioner (CAC) and Air Source Heat Pump (ASHP) specification. It contains the following information:

- Summary of the Version 4.0 specification
- Summary of key milestones in the development of the Version 4.0 specification
- Summary of comments provided by stakeholders
- EPA's rationale for deciding on key elements of the final Version 4.0 specification

**II. Summary of Version 4.0 Specification**

In January 2006, the Federal standard for CAC and ASHPs will increase to 13 SEER. As a result the ENERGY STAR specification needed to be updated to capture energy savings beyond the standard in a way that is cost effective for the consumers and maintains product performance.

Because the marginal benefit to consumers of selecting higher SEER equipment will be less than in the past, and the potential benefits from improving the installation of HVAC systems are large (on the order of 10 to 20 percent savings in heating and cooling costs) the original intent of revising the specification for CAC and ASHPs was to move away from an equipment specification and instead establish requirements for quality installation. However, feedback received early in the revision process from a wide array of stakeholders stressed the importance of maintaining a separate equipment specification.

Key elements of the Version 4.0 ENERGY STAR specification for CAC and ASHPs are described below.

- To be eligible for ENERGY STAR qualification, CAC equipment must meet or exceed the criteria for both SEER and EER, and an ASHP must meet SEER, EER, and HSPF requirements as follows:

<b>TIER 1</b>			
<b>Energy-Efficiency Criteria for Qualified Residential ASHPs and Central Air Conditioners</b>			
Product Type	SEER	EER	HSPF (for heat pumps only)
Split Systems	≥ 14	≥ 11.5	≥ 8.2
Single Package Equipment (including gas/electric package units)	≥ 14	≥ 11	≥ 8.0

<b>TIER 2</b>			
<b>Energy-Efficiency Criteria for Qualified Residential ASHPs and Central Air Conditioners</b>			
Product Type	SEER	EER	HSPF (for heat pumps only)
Split Systems	≥ 14.5	≥ 12	≥ 8.2
Single Package Equipment (including gas/electric package units)	≥ 14	≥ 11	≥ 8.0

- The specification has two tiers. Tier I is effective April 1, 2006, nearly coincidental to the effective date of the Federal standard. Tier II will be effective January 1, 2009.
- For split system CAC and ASHPs, ENERGY STAR requires that the system be a matched assembly as defined within Section 1 of the Version 4.0 Eligibility Criteria. By requiring the system to be a matched assembly, ENERGY STAR does not allow for a situation where a new condenser unit is matched with an existing (previously installed) evaporator coil, thereby delivering the promised energy efficiency and proper functioning.
- Ductless mini-split equipment that meets the energy efficiency criteria can qualify for ENERGY STAR.
- Partners are required to provide a disclaimer whenever the ENERGY STAR certification mark is used in connection with qualifying equipment in advertising, on specification sheets, on marketing materials, and on the manufacturer's Internet site. In addition Partners are required to provide detailed information in installation manuals that stresses the importance of proper installation.
- The specification continues to allow for ENERGY STAR qualification of gas/electric packaged units as long as they meet the energy efficiency criteria.
- EPA does not plan to independently develop a complete list of qualifying equipment. Instead, assuming the Consortium for Energy Efficiency (CEE) adopts the ENERGY STAR levels as their Tier 1, partners will be encouraged to use the CEE Directory of ARI Verified Equipment to determine which model combinations meet the energy-efficiency criteria for qualified residential CAC and ASHPs. Any manufacturers that do not participate in the ARI certification program will be expected to submit product information directly to EPA for listing on the [www.energystar.gov](http://www.energystar.gov) web site.

### **III. Key Milestones of Specification Development**

- The Version 4.0 specification was developed over the course of one year, which included the following key milestones:
  - An “Options Document” was distributed to all ENERGY STAR HVAC stakeholders on September 29, 2005 outlining the options that EPA could pursue in revising the ENERGY STAR specification for CAC and ASHPs. Options included requiring that a system be properly installed and verified as such before being qualified for ENERGY STAR. Comments on this document were requested by October 27, 2005.
  - The 2004 ENERGY STAR HVAC Partner and Stakeholder Meeting held October 4, in Chicago, Illinois to discuss the various options and help EPA determine a path forward.
  - Four Draft specifications were distributed to stakeholders as follows:
    - Draft 1 sent on January 28, 2005 with comments due by March 25, 2005. This deadline was subsequently extended to April 8, 2005.
    - Draft 2 sent on May 27, 2005 with comments due by June 24, 2005.
    - Final Draft sent on July 1, 2005 with comments due by July 22, 2005.
    - Revised Final Draft sent on August 2, 2005 with comments due by August 23, 2005.
  - Presentation given at ACEEE Market Transformation Symposium on March 15, 2005 in Washington D.C. to review the status of the specification revision process for participants.
  - Meetings with stakeholders as follows:
    - ARI
    - CEE
    - Carrier
    - ARI
  - The specification was finalized on September 14, 2005 via a letter to stakeholders.
  - Tier 1 will be effective on April 1, 2006; Tier II will become effective on January 1, 2009.
  
- Although the Version 4.0 specification addresses only equipment requirements, EPA is continuing to work with the HVAC industry and the energy efficiency community to design a program that will encourage the proper installation and verification of HVAC equipment.

#### **IV. Summary of Stakeholder Input**

EPA received substantial stakeholder input in the development of the revised specification.

- Energy Efficiency Criteria – From the beginning of the specification revision process, all stakeholders agreed that the Seasonal Energy Efficiency Ratio (SEER) for ENERGY STAR qualified split systems and single package equipment should be set at 14. Stakeholders also agreed that the Energy Efficiency Ratio (EER) and the Heating Seasonal Performance Factor (HSPF) for single package equipment should be set at 11.0 and 8.0 respectively. With regard to the EER and HSPF of split systems, there was less agreement.
  - EER – In Draft 1, EPA proposed an EER level of 12.0 for split systems. In response, commentors argued that a level of 11.5 was more appropriate to accommodate equipment of higher tonnages since fewer higher tonnage model combinations are available that meet this level. In addition some commentors suggested that there is issue with the lack of measurement precision for EER and that the levels reported are not accurate but that the issue is being resolved through the Air Conditioning and Refrigeration Institute (ARI)

certification process. Other commentors insisted that adequate equipment supply existed at the 12.0 EER level and provided data to this effect. They also stressed the need for the higher EER level in order to adequately address the issue of peak load in various parts of the country. In the end, EPA concluded that delaying the 12 EER requirement is appropriate and therefore set two tiers: tier I with an EER of 11.5 for the near term, and tier II with an EER of 12.0 and an even higher SEER of 14.5 for the longer term.

- HSPF – In Draft 2, EPA changed the proposal for HSPF of split systems from 8.5 to 8.2. Based on a review of ARI data adjusting the HSPF has a more significant impact on product availability for heat pumps than adjusting the EER level. Therefore in order to ensure that product availability of ENERGY STAR qualified heat pumps was more on par with that for ENERGY STAR qualified CAC, EPA adjusted the HSPF requirement to 8.2.

- Who Can Be a Partner - In Draft 1, EPA proposed that the term Partner refer to those entities that have an EPA-approved program that includes a protocol for verifying that systems have been installed to meet manufacturer’s specifications for air flow and refrigerant charge and that the system has been installed according to Manual J<sup>®</sup> (or equivalent). In this scenario, EPA would have severed partnerships with equipment manufacturers unless they could provide a program as described above. In light of EPA’s subsequent decision to retain the equipment specification, the partnership with equipment manufacturers will continue allowing them to label qualifying equipment and marketing materials according to the revised energy efficiency criteria.
- Inclusion of Installation in the Specification (Two Labels) vs. Separate Equipment Criteria – In Draft 1, EPA proposed that manufacturers would no longer be able to label equipment as it is shipped from the factory with the ENERGY STAR certification mark. Nor would manufacturers be allowed to use the logo on product literature that is distributed nationwide. Instead, Partners (as described above) would label installed systems and/or award homeowners with a certificate of qualification for their system once verified according to an EPA approved verification program. In response to numerous comments on Draft 1, EPA decided to allow manufacturers to label qualifying equipment and marketing materials according to the revised energy efficiency criteria. More specifically, several commentors suggested that EPA develop a 2-label system for CAC/ASHPs: one label to be placed on equipment by manufacturers at the factory; and a second to be placed by the verifier once the system is installed and verified as being done so properly. Although considered, a 2-label system was not developed.

EPA decided to continue allowing the use of the certification mark in association with qualifying equipment as long as it is used in a way that raises consumer awareness about the importance of proper installation. Therefore, the Partner Commitments section of the specification requires that whenever the ENERGY STAR certification mark is used in connection with a qualifying product in advertising, on specification sheets, on marketing materials, and on the manufacturer’s Internet site, the following disclaimer language must be provided: “Proper sizing and installation of equipment is critical to achieve optimal performance. Split system air conditioners and heat pumps must be matched with appropriate coil components to meet ENERGY STAR criteria. Ask your contractor for details or visit [www.energystar.gov](http://www.energystar.gov).” EPA will closely monitor the use of the ENERGY STAR logo and disclaimer language in marketing materials and will be diligent about notifying Partners should any logo use violations be identified.

In addition Partners are required to provide detailed information in installation manuals that stresses the importance of proper installation. This information should be written for the equipment installer and should include the following paragraph.

For Package Units:

**IMPORTANT** - This product has been designed and manufactured to meet ENERGY STAR criteria for energy efficiency. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow the manufacturer's refrigerant charging and air flow instructions. **Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.**

For Split-System Units:

**IMPORTANT** - This product has been designed and manufactured to meet ENERGY STAR criteria for energy efficiency when matched with appropriate coil components. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow the manufacturer's refrigerant charging and air flow instructions. **Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.**

- Gas/Electric Packaged Units – Based on several comments, EPA considered eliminating gas/electric packaged units from this specification until a heating requirement could be instituted, along with the cooling requirement, for these units. At the time of this specification revision, EPA was not able to specify a heating requirement. The majority of comments received on the proposal to eliminate gas/electric package units were opposed to their elimination, with some encouragement for EPA to continue investigating the issue for future revisions. With this feedback, EPA decided to retain gas/electric packaged units in the specification and will continue to look at the possibility of including a heating requirement in the future should technology and economics justify doing so.
- Ductless Mini-Splits – During the course of this specification revision, EPA was approached by several manufacturers of ductless mini-split air conditioning equipment wanting to qualify their equipment as ENERGY STAR. Although this type of equipment represents a small percentage of the US market for air conditioning equipment, it is categorized among central air conditioning systems according to ARI 210/240. Therefore, EPA saw no reason to exclude it from qualifying as ENERGY STAR as long as it meets the energy efficiency criteria. In order to ensure that ductless, mini-split equipment is not interpreted as excluded from this specification, the following sentence was removed from the definitions for single package, split system, and gas/electric package unit: “Air is treated at a central location and carried to and from the rooms in a house by one or more fans and a system of ducts.” Removal of this sentence does not change the definition except to allow the inclusion of ductless, mini-split equipment.
- 3-Phase vs. Single Phase Equipment – One commentor requested that the ENERGY STAR specification be extended to include 3-phase residential and commercial equipment rated below 65,000 BTuh. Another commentor requested that the specification be revised to more clearly articulate that it covers only single-phase equipment. EPA did not extend the specification to include 3-phase equipment as this equipment is already included within the ENERGY STAR specification for Light Commercial HVAC. In addition, since the specification clearly states within Section 2, Parts A and B, that it only covers single-phase equipment, EPA did not deem it necessary to repeat similar language within the specification.

- Matched Assembly – Throughout the specification revision process several comments were received on the definition of a “Matched Assembly.” The definition contained in the Final Specification, “A matched assembly is a model combination that is listed in the ARI directory of Certified Equipment or for which the manufacturer has published energy efficiency data that includes rated SEER and EER levels, and in which both the condenser unit and evaporator coil are installed simultaneously. A matched assembly shall also include the air handler, furnace, or other component that is used to determine the rating according to ARI 210/240,” addresses all of the comments received.

In addition, one commentator noted a potential inconsistency of requiring a matched assembly for a specific condenser/evaporator combination as listed in the ARI Directory, yet allowing the energy efficiency rating of a split system to be based on the most commonly sold combination as initially indicated in the definition of “Split system.” To address this issue and clarify EPA’s intent, the definition for split system was revised to eliminate the option of the efficiency rating being based on the most commonly sold combination.

- Request for Transition Period – In response to Draft 1, EPA received comments from several stakeholders proposing a six-month transition period (to July 23, 2006) for qualifying products. This would allow the supply side a reasonable amount of time to sell remaining inventory that may be labeled as ENERGY STAR and acknowledge that some 13 SEER equipment with preexisting ENERGY STAR labels will still be available in the market in 2006. ENERGY STAR has instituted a programmatic elimination of grandfathering across all product categories as specifications are revised. EPA realizes that preexisting labeled equipment will be in the market and that manufacturers cannot be expected to remove labels from equipment that is already in the distribution channel, therefore, we allow the date of manufacture to be used as a cut off for equipment labeling. The language in Section 6, Effective Date, clearly articulates that the date of manufacture is the date that is used to determine qualification with the ENERGY STAR specification. By using the date of manufacture, the need for the proposed six-month transition period requested by commentators is eliminated.
- Effective Date – In Draft 1, EPA proposed a two part effective date: January 26, 2006 for the energy-efficiency criteria portion of the proposed specification and January 1, 2007 for the installation criteria of the specification. The January 26, 2006 date would exactly coincide with the effective date of the new Federal Standard. The January 1, 2007 date would allow time for potential Partners to develop program plans that address the eligibility criteria for installation and have these plans approved by EPA.

With the elimination of the installation criteria from subsequent drafts, EPA then proposed a single effective date of March 27, 2006. This new date would allow time to finalize the specification and give manufacturers ample time to institute the revision into their company practices. Although the effective date no longer coincided with the date of the new Federal standard, it is shortly thereafter and will still allow the new specification to be in place for the 2006 cooling season. This date was then slightly adjusted to April 1, 2006 so that it coincides with the first of the month since some manufacturers only mark the month and year of manufacture on equipment.

In the Revised Final Draft, EPA proposed a two tier specification. The effective date of Tier I remained at April 1, 2006. The effective date for Tier II was placed at January 1, 2009.

## V. EPA Rationale for Specification

EPA uses a consistent set of criteria in the development and revision of specifications for ENERGY STAR qualified products. These criteria guide EPA in its decision making and help EPA ensure that the ENERGY STAR mark will continue to be a trustworthy symbol for consumers to rely upon as they purchase products for the home or business and so that their purchases will deliver substantial environmental protection. These criteria include:

- Significant energy savings and environmental protection potential on a national basis;
- Efficiency level is technically feasible while product performance is maintained or enhanced;
- Labeled products will be cost-effective to the buyer;
- Efficiency can be achieved with several technology options, at least one of which is non-proprietary (i.e., not exclusive to proprietary technology);
- Product differentiation and testing are feasible; and
- Labeling would be effective and recognizable in the market.

Below EPA addresses the Version 4.0 CAC/ASHP specification relative to each of these criteria.

- Expected Energy Savings and Environmental Benefits. - The anticipated savings from a 14 SEER system compared with a 13 SEER system is minimal and has been estimated at 7%. More substantial savings would have been anticipated from various installation measures that EPA was entertaining in earlier drafts. Continued work on developing a “Best Practices” effort for installation could still yield some if not all of the savings listed in the table below:

### Potential Savings for CAC/ASHP Systems

	Savings Range/Average
14 SEER	7%
Sizing	2 – 10%
Refrigeration Charge	12.5%
Airflow	8.1%
Duct Leakage	16.8%

Installation savings are not additive

- Technical Feasibility/Impact on Product Performance/Functionality. While product availability of high efficiency product is somewhat uncertain due to the upcoming change to the Federal standard, EPA believes the energy use requirements of this specification are technically feasible and will not adversely impact product performance. The ARI Directory contains a full range of model combinations in terms of efficiency: from SEER 10 (the current minimum efficiency standard) to SEER 18 and higher. Manufacturers have used efficiency in the past as a feature to sell premium product. In fact, contractors have been selling using “Good-Better-Best” scenarios in terms of efficiency. This selling tactic will likely change with the new Federal standard but manufacturers will continue to supply high efficiency equipment with same or better features.

- Cost-Effectiveness. EPA is aware that the Version 4.0 specification provides marginal cost effectiveness for consumers. However, it is especially difficult to accurately estimate the cost-effectiveness of the proposed specification because of the state of flux of this industry. Because of the new Federal standard taking effect at the end of January 2006, manufacturers are in the process of redesigning their entire product lines so that they have as much available that meets the new standard as possible. Therefore data on the costs of equipment that meet the new standard are very limited and its accuracy is questionable.

Although under current prices, ENERGY STAR qualified CAC and ASHPs are not cost effective, EPA anticipates that promotion of these products will be limited to areas where rebates are available, which will serve to bring down the purchase price. Ultimately, EPA also anticipates that as manufacturers adjust to the new Federal standard, prices will come down and the cost effectiveness of the equipment will improve.

- Several Technology Options, including some with Non-proprietary Technology. EPA designs its ENERGY STAR specifications to be performance-based. This means that it strives to recognize the better performing CAC and ASHPs in terms of energy efficiency without differentiating based on technology. EPA went one step further by removing language that effectively eliminated ductless, mini-split technology from qualifying for ENERGY STAR. This equipment may now qualify as long as it meets the energy efficiency criteria.
- Testing Procedure. As with previous ENERGY STAR specifications to CAC and ASHPs, Version 4.0 references an existing and industry accepted test procedure by citing ARI Standard 210/240 “2003 Standard for Unitary Air-Conditioning and Air-Source Heat Pump Equipment.”
- Product Differentiation and Labeling. Market research and investigation of the ARI Directory showed that product performance varies within a sufficient range to allow for meaningful differentiation to the purchaser.