



How to Buy an Energy-Efficient Residential Central Air Conditioner

Energy Efficiency and Renewable Energy
Federal Energy Management Program

Why Agencies Should Buy Efficient Products

- Executive Order 13123 and FAR Part 23 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR[®] product labeling program.
- Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.
- As the world's largest consumer, the federal government can help "pull" the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.

For More Information:

- DOE's Federal Energy Management Program (FEMP) Help Desk and web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
Phone: (800) 363-3732
www.eren.doe.gov/femp/procurement
- Environmental Protection Agency has maintains a database of central air conditioners that comply with the ENERGY STAR[®] specification found in this recommendation.
Phone: (888) 782-7937
www.energystar.gov/products
- American Council for an Energy-Efficient Economy (ACEEE) publishes the *Consumer Guide to Home Energy Savings*.
Phone: (202) 429-0063
aceee.org
- Consortium for Energy Efficiency (CEE) has utility programs promoting energy-efficient central air conditioners and publishes the *Specification of Energy-Efficient Installation and Maintenance Practices for Residential HVAC Systems*.
Phone: (617) 589-3949
www.cee1.org
- Air Conditioning Contractors of America (ACCA) publishes *Manual J*, a load calculation guide for residential heating and air conditioning, and *Manual S*, a sizing guide for heating and cooling equipment.
Phone: (202) 483-9370
www.acca.org
- *Home Energy* magazine provides energy conservation tips.
Phone: (510) 524-5405
www.homeenergy.org
- Lawrence Berkeley National Laboratory (LBNL) provided supporting analysis for this recommendation.
Phone: (202) 646-7950

Efficiency Recommendation ^a		
Product Type ^b	Recommended Level	Best Available
Split Systems	11.0 or more EER 13.0 or more SEER ^c	14.6 EER 16.5 SEER
Single Package	10.5 or more EER 12.0 or more SEER	12.2 EER 16.0 SEER

- a) This efficiency recommendation meets the ENERGY STAR specification effective October 1, 2002 (see "For More Information").
- b) Split system and single package units with capacity under 65,000 Btuh are covered here, including both gas and electric units. This recommendation excludes window units and packaged terminal units.
- c) Based on DOE test procedure, see 10 CFR 430, Sub-Part B, Appendix M.

For central air conditioners purchased through commercial sources (retailer or distributor), specify or purchase ENERGY STAR models that meet or exceed this Recommendation. Alternatively, look at the yellow "EnergyGuide" label to identify models with a SEER that meets or exceeds this recommendation. If utility peak demand charges are a concern, buyers should specify this recommended EER, which is a better measure of determining peak loads.

Oversizing of air conditioners, besides raising purchase cost, will result in reduced energy efficiency, poorer humidity control, and shorter product life, all due to excessive on-off cycling. The required air conditioner capacity should be determined based on the referenced ACCA calculation procedure (see "For More Information").

Leaky ductwork is responsible for substantial energy losses and comfort problems in most residences; consider sealing ducts when installing a central air conditioner. Placing the outdoor ("condensing") unit in a well-shaded area can also

Definition

EER, or Energy Efficiency Ratio, is the cooling capacity (in Btu/hour) of the unit divided by its electrical input (in watts) at the Air Conditioning and Refrigeration Institute's (ARI) standard peak rating condition of 95°F.

SEER (Seasonal Energy Efficiency Ratio) is the total cooling output (in Btu) provided by the unit during its normal annual usage period for cooling divided by the total energy input (in Wh) during the same period.

How to Select an Energy-Efficient Central Air Conditioner



Sizing

Installation and User Tips

reduce energy consumption. Consider leaving air conditioning off during unoccupied hours, or using a set-back thermostat to minimize unnecessary operation of the unit. CEE has published specifications for installation and maintenance of energy efficient residential air conditioning systems (see “For More Information”).

Refrigerants with ozone-destroying chlorofluorocarbons (CFCs) were used many years ago in central air conditioners but most existing equipment today uses HCFC refrigerants, which have a much lower ozone-depleting effect. There are some central air conditioner models now on the market that use refrigerants with no ozone-depleting effect; ask your supplier for information. When retiring a central air conditioner that contains CFCs or HCFCs, the Clean Air Act requires that the refrigerant be recovered on-site by a certified technician. For compliance information, contact the EPA Stratospheric Ozone Information Hotline at (800) 296-1996.

Environmental Tips

Central Air Conditioner Cost-Effectiveness Example (36,000 Btu/hour - 3 tons, split system)

Performance	Base Model ^a	Recommended Level	Best Available
EER / SEER	9.2 / 10.0	11.0 / 13.0	14.5 / 16.5
Annual Energy Use	3,600 kWh	2,770 kWh	2,180 kWh
Annual Energy Cost	\$216	\$166	\$131
Lifetime Energy Cost	\$2,350	\$1,800	\$1,420
Lifetime Energy Cost Savings	-	\$550	\$930

a) The SEER efficiency of the Base Model is just sufficient to meet the current U.S. DOE national standard. The EER of 9.2 of the Base Model shown represents the most common model on the market. SEER, and EER may apply to different models.

Cost Effectiveness Assumptions

Annual energy use in this example is based on the standard DOE test procedure for a model with a cooling capacity of 36,000 Btu/hour and 1,000 cooling load hours per year. The assumed (federal) average electricity price is 6¢/kWh (including demand charges).

Using the Cost-Effectiveness Table

In the example shown above, a (3-ton, split system) central air conditioner with an EER of 11.0 and an SEER of 13.0 is cost-effective if its purchase price is no more than \$550 above the price of the Base Model. The Best Available model, with an SEER of and an EER of is cost-effective if its price is no more than \$930 above the price of the Base Model.

What if my Electricity Prices, Cooling Load Hours, or Cooling Capacity are different?

To calculate Lifetime Energy Cost Savings for a different electricity price, multiply the savings in the above table by this ratio: $\left(\frac{\text{Your price in } \$/\text{kWh}}{6.0 \text{ } \$/\text{kWh}}\right)$. Similarly, for a different

cooling load, multiply the savings by this ratio: $\left(\frac{\text{Your cooling load hours}}{1,000}\right)$. Cooling load

hours for your region can be estimated from maps available in several references, including Appendix B1 (Figure 1) of this binder and the Code of Federal Regulations (10 CFR 430, Sub-Part B, Appendix M). For a unit with a different cooling capacity, multiply the savings by: $\left(\frac{\text{Your units cooling capacity}}{36,000 \text{ Btu/hr}}\right)$.

Definition

Lifetime Energy Cost is the sum of the discounted value of annual energy costs based on average usage and an assumed air conditioner life of 15 years. Future electricity price trends and a discount rate of 3.2% are based on federal guidelines (effective from April, 2002 to March, 2003).

Metric Conversion

1000 Btu/h = 293 watts
 $^{\circ}\text{F} = (1.8 \text{ } ^{\circ}\text{C}) + 32$

